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GROWING COLORADO PLANTS FROM SEED: A STATE OF THE ART

Volume II: Grasses and Grasslike Plants

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Fish and Wildlife Service

U.S. Department of the Interior

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August 1982

GROWING COLORADO PLANTS FROM SEED: A STATE OF THE ART

VOLUME II: GRASSES AND GRASSLIKE PLANTS

by

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RESEARCH SUMMARY

Information on the germination and establishment of native and naturalized forbs has become increasingly important as more and more lands are disturbed by energy development and population influences in the West. Available information is of variable quality, quantity, and accessibility. The purpose of the investigation was to compile existing germination and plant propagation information for persons planting native or naturalized Colorado forbs. The first volume in the series covered Colorado shrubs and was published by the USFS in 1981. Included in this second volume is information on seed procurement, pretreatment, and laboratory germination of and cultural practices for grass species. Also included are literature citations, a list of Colorado grasses that have been evaluated by USDA Soil Conservation Service Plant Materials Centers, a list of varieties and cultivars released by the plant materials centers, and addresses of plant materials centers in the western United States.

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INTRODUCTION

Reclamation of disturbed lands will increase in importance as demand for food and energy increases. Revegetation of disturbed sites in the western United States is often difficult due to extreme environmental conditions, such as harsh climate and unfavorable edaphic conditions. Yet, establishment of productive, self-sustaining ecosystems similar to native ecosystems is desirable. Success in such an endeavor requires detailed knowledge of the ecological requirements of a wide variety of native, introduced, and naturalized plants. Future reclamation efforts may require greater knowledge than is currently available.

Computerized information storage and retrieval systems such as the Plant Information Network (Vories and Sims, 1977) provide a highly sophisticated tool for reporting plant species adaptability and desirability for planting on a given site. Although such information is necessary in selecting appropriate species for use in revegetation, knowledge of how to propagate and cultivate these species under field conditions is required. Existing information regarding propagation and cultivation of numerous species, particularly native species, is incomplete and often insufficient. Available information is widely dispersed through the literature and is difficult to access or integrate into a usable format.

The objectives of this publication are to:

1. Arrange published information concerning seed germination and cultural practices of grasses and grasslike plants occurring in Colorado into an easily used and understood format;

2. Identify which grasses and grasslike plants occurring in Colorado have been adequately studied in terms of their germination characteristics and cultural practices;

3. Identify publications useful to persons engaged in establishment of grasses and grasslike plants in Colorado.

METHODS

Compilation of this publication consisted of an exhaustive literature search of library publications, periodicals, and government agency reports. The information is presented by species in four general categories: procurement, pretreatment, laboratory germination, and cultural practices. Because of the wide variability in format and quality of information available, each information bit is cited as to where it was obtained. The order of citation is strictly from the most recent to the oldest. Generic and specific names used in this publication are those most commonly encountered in the literature. In addition, seed unit weights are reported as number of seeds per ounce, gram, kilogram, or pound. If no units are given, the information represents number of seeds per pound.

Grasses and grasslike plants found in Colorado which have been evaluated at the USDA Soil Conservation Service Plant Materials Centers in 10 western states are listed. Information on these species was obtained from reports supplied by Plant Materials Centers in each state.

SUMMARY OF RESULTS

Information identifying grasses or grasslike plants native or naturalized to the state of Colorado was obtained from Harrington (1964) and the Plant Information Network (PIN) of the Western Energy and Land Use Team, U.S. Fish and Wildlife Service, Fort Collins, Colorado. According to information provided by PIN, 327 grass species and varieties are native or naturalized to Colorado. In addition, 194 grasslike species are native or naturalized to Colorado. Information on 186 of the grass species and 61 of the grasslike species was found in 316 publications. Good or adequate information in each of the four information categories existed for 45 species. They are: *Agropyron cristatum*, *A. desertorum*, *A. elongatum*, *A. inerme*, *A. intermedium*, *A. smithii*, *A. spicatum*, *A. trachycaulum*, *A. trichophorum*, *Agrostis alba*, *Alopecurus pratensis*, *Andropogon gerardi*, *A. hallii*, *A. scoparius*, *Arrhenatherum elatius*, *Bouteloua curtipendula*, *B. eriopoda*, *B. gracilis*, *Bromus catharticus*, *B. inermis*, *B. marginatus*, *Buchloe dactyloides*, *Cynodon dactylon*, *Dactylis glomerata*, *Elymus canadensis*, *E. junceus*, *Eragrostis trichodes*, *Festuca arundinacea*, *Lolium multiflorum*, *L. perenne*, *Oryzopsis hymenoides*, *Panicum obtusum*, *P. virgatum*, *Phalaris arundinacea*, *Phleum pratensis*, *Poa ampla*, *P. bulbosa*, *P. compressa*, *P. pratensis*, *Setaria macrostachya*, *Sorghastrum nutans*, *Sorghum halepense*, *Sporobolus airoides*, *S. cryptandrus*, and *Stipa viridula*. It should be noted that almost half of these are introduced tame pasture grasses which have become naturalized in Colorado. Only marginal seed propagation information existed for the remaining 202 species. Information is especially lacking for sedges and rushes. The information on laboratory germination and cultural practices was usually inadequate. At least one of ten western USDA Soil Conservation Service Plant Materials Centers is currently evaluating 138 grasses and 3 grasslike species native or naturalized to Colorado. Although these centers have only limited seed for testing, they should be a good source of information on plant propagation when such information is lacking in the literature.

GERMINATION AND PROPAGATION INFORMATION BY SPECIES

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AGROPYRON CRISTATUM (L.) Gaerin.
and
AGROPYRON DESERTORUM (Fish.) Schult.
Fairway and Standard Crested Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 19,450/oz, 685/g (Fairway) and 11,340-12,925/oz, 400-455/g (Standard) (AOSA, 1978); 440,000/kg (Heady, 1975); 200,000/lb (Vallentine, 1971; Hafenrichter et al., 1968; Cooper et al., 1957); 204,000/lb (Atkins & Smith, 1967); 32,000/lb (Fairway) and 190,000/lb (Standard)(Wheeler & Hill, 1957); 175,000/lb (Stefferud, 1948); 165,000-200,000 (Hoover et al., 1947)

SEED MATURITY: Jul 11-Aug 30 (Atkins & Smith, 1967); Early summer (Cooper et al., 1957); Late Jun in Central Plains (Wheeler & Hill, 1957; Hoover et al., 1947)

METHOD OF COLLECTION: Combine preferred, windrower can also be used (Atkins & Smith, 1967); Combine directly, harvest with a binder or header, or with a swather and a pickup attachment combine (Harmond et al., 1961; Wheeler & Hill, 1957; Archer & Bunch, 1953; Hoover et al., 1948; Hoover et al., 1947); Combine (Cooper et al., 1957); Binder or combine (Wolff, 1951); Grain binder (Wheeler, 1950)

METHOD OF CLEANING: Hammermill to break up seed cluster then clean with a fanning mill (Wheeler & Hill, 1957; Keim & Newell, 1955); Fanning mill (Archer & Bunch, 1953; Wheeler, 1950)

PRETREATMENT

DURATION OF GOOD VIABILITY: 12 years (Hafenrichter et al., 1968); 2 years or more (Wheeler & Hill, 1957); 5 years or more (Hull & Pearse, 1943a); Greater than 58 months (McAlister, 1943); 4 years (Love & Hanson, 1932)

STRATIFICATION: KNO$_3$ and prechill at 5° or 10°C for 7 days (AOSA, 1978); Prechill 4 days at 6°C (Potter, 1951); 10°C dark for 7 days (Andersen & Drake, 1944); Prechill 6 days at 8-10°C (Hay, 1936); Prechill 4 days at 6-8°C (Hay, 1935)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (McGinnies, 1960a); 15-20°C (Potter, 1951); 15°C (Andersen & Drake, 1944); 19-21°C (Hay, 1935); Fluctuating: 15-25°C and 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 20-30°C at 16-8 hours (Potter, 1951); 20-30°C, 10-30°C, 15-30°C, and 15-25°C at 18-6 hours (Andersen & Drake, 1944); 14-17°C and 20-22°C at 16-8 hours (Hay, 1936)

MOISTURE: Optimum: Up to 7 1/2 atm (McGinnies, 1960a)

LIGHT: Light optional (AOSA, 1978); Light required (USDA, 1952)

GERMINATIVE ENERGY: 69% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 85% (Hafenrichter et al., 1968; Wheeler & Hill, 1957; Stefferud, 1948); 86% (Wolff, 1951)

CULTURAL PRACTICES

PLANTING DEPTH: 1.8 cm (Ludwig, 1976); 1/2" on sandy loams, 1/4" if the soil is high in clay (Lang et al., 1975); 1/2-1" (McGinnies, 1973, 1960b; Archer & Bunch, 1953); 1/2" (Hull, 1964, 1948; Hull et al., 1958; McWilliams, 1955; Rogler, 1954; Hull & Doran, 1950; McKenzie et al., 1946); 3/4-1" Allred & Nixon, 1955); 1/4" (Plummer, 1943); <1" (Hermann & Hermann, 1939); 1/4-1/2" (Love & Hanson, 1932)

PLANTING TIME: Early spring (Ludwig, 1976); Fall on sierozem soils and fall or early spring on brown and chestnut soils (Hafenrichter et al., 1968); First 2 weeks of Apr (Bement et al., 1965), Best results from fall plantings (Kilcher, 1961); Fall (Douglas et al., 1960); Apr 1 (McGinnies, 1960b); Sep 20 (McWilliams, 1955); Early fall (Frischknecht, 1951); From Sep until cold weather or spring in southern part of range (Hoover et al., 1948); Late summer or early fall (Hull, 1948); Sep-Oct and Feb-Mar (Stefferud, 1948); Spring preferable to fall (Hoover, 1939)

EXPOSURE: Fairly shade tolerant (Plummer et al., 1968)

SOIL TEXTURE: Adapted to loamy, clayey (Heady, 1975; Stefferud, 1948); Clayey-good, silty-good, sandy-fair (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967); Light sandy loams to heavy clays (Rogler, 1962; Walker, 1950; Stewart & Walker, 1939)

SOIL MOISTURE: Low moisture requirement (Cooper et al., 1957); Moderate to dry (Hull & Johnson, 1955)

PRECIPITATION: 5-14" annual (Lang et al., 1975); 10" or more annual (USDA, For. Ser., 1966); 11-16" annual (Jefferies & Cardwell, 1964); Annual rainfall >17" (USDA, For. Ser., 1937)

DRAINAGE: Well drained (USDA, For. Ser., 1966; Plummer et al., 1943; Stewart & Walker, 1939)

AGROPYRON DASYSTACHYUM (Hook.) Scribn.
Thickspike Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 154,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)

METHOD OF COLLECTION: May be combined (Wheeler & Hill, 1957)

LABORATORY GERMINATION

TEMPERATURE: Constant: 30°C for 3 days then 20°C (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 85% (Wheeler & Hill, 1957)

CULTURAL PRACTICES

SOIL TEXTURE: Moderately coarse textured (Hafenrichter et al., 1968); Sandy (USDA, For. Ser., 1937)
SOIL MOISTURE: Moist (Hull & Johnson, 1955)
PRECIPITATION: 5-9" annual (Lang et al., 1975)
DRAINAGE: Well-drained (Hull & Johnson, 1955)

AGROPYRON ELONGATUM (Host) Beauv.
Tall Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis

PROCUREMENT

SEEDS/UNIT WT: 4,650-4,750/lb, 400-455/g (AOSA, 1978); 175,000/kg (Heady, 1975); 79,000 (Vallentine, 1971; Atkins & Smith, 1967; Wheeler & Hill, 1957; Stefferud, 1948); 80,000 (Cooper et al., 1957)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Early fall (Cooper et al., 1957)
METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967); Harvest with a binder (Wheeler & Hill, 1957)

PRETREATMENT

STRATIFICATION: KNO_3 and prechill at 5°C for 5 days (AOSA, 1978)
SCARIFICATION: Pierce integumentary layer of caryopsis with sharp needle (Thornton, 1966b)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C and 20-30°C at 16-8 hours (AOSA, 1978); 15-30°C at 16-8 hours (Thornton, 1966b)
LIGHT: Required at 20-30°C, optional at 15-25°C (AOSA, 1978)
GERMINATIVE CAPACITY: 90% (Atkins & Smith, 1967; Wheeler & Hill, 1957; Stefferud, 1948); 89% (Cooper et al., 1957)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (McKenzie et al., 1946)
PLANTING TIME: Early spring if irrigated, Aug 15-Sep 15 below 4,000' (Hafenrichter et al., 1968); Early fall (Frischknecht, 1951)
SOIL TEXTURE: Adapted to loamy, clay (Heady, 1975): Silty-good, clayey-good, sandy-poor (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967)
SOIL pH: Adapted to alkali (Heady, 1975; Hafenrichter et al., 1968); 4.7-9.5 (Moyer & Seamands, 1975); Particularly adapted to saline or alkali soils (Keim & Newell, 1955)
SOIL MOISTURE: Adapted to wet (Heady, 1975; Keim & Newell, 1955); High moisture requirement (Cooper et al., 1957)
PRECIPITATION: 5-9" annual (Lang et al., 1975). At least 14" mean annual (Hafenrichter et al., 1968); 17+" annual (Jefferies & Cardwell, 1964)
DRAINAGE: Performs well in poorly drained (Moyer & Seamands, 1975); poorly drained (Keim & Newell, 1962)

AGROPYRON INERME (Scribn. & Smith) Rydb.
Beardless Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 150,000/lb (Wheeler & Hill, 1957; Stefferud, 1948); 330/g (Haferkamp & McSwain, 1951)
METHOD OF COLLECTION: Harvest with binder (Wheeler & Hill, 1957)

PRETREATMENT

DURATION OF GOOD VIABILITY: 5 years (Hull & Pearse, 1943a)
STRATIFICATION: KNO_3 and prechill at 5° or 10°C for 7 days (AOSA, 1978); Prechill 3 days or 2 weeks (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (McGinnies, 1960a); Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
MOISTURE: Optimum: Up to 7 1/2 atm (McGinnies, 1960a)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 90% (Wheeler & Hill, 1957); 85-90% (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Vogel, 1963)
PLANTING TIME: Fall (Douglas et al., 1960); Spring, fall under semiarid conditions (Wheeler & Hill, 1957)
SOIL TEXTURE: Silt loam (Wheeler & Hill, 1957)
PRECIPITATION: 10-14" annual (Lang et al., 1975)
DRAINAGE: Well drained (Wheeler & Hill, 1957; Plummer et al., 1955; Plummer et al., 1943; Robertson & Pearse, 1943)

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AGROPYRON INTERMEDIUM (Host) Beauv.
Intermediate Wheatgrass

FAMILY: Gramineae
LIFEFORM: Perennial introduced grass
FRUIT: Caryopsis (Hitchcock, 1971)

PROCUREMENT

SEEDS/UNIT WT: 4,595-5,415/oz, 100-190/g (AOSA, 1978); 220,000/kg (Heady, 1975); 93,000/lb (Vallentine, 1971; Atkins & Smith, 1967); 90,000/lb (Cooper et al., 1957); 38,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Late summer (Cooper et al., 1957)
METHOD OF COLLECTION: Combine preferred, also windrower (Atkins & Smith, 1967; Cooper et al., 1957); Harvest with a combine (Wheeler & Hill, 1957); Combine direct, binder or swather followed by a combine with pickup attachment (Archer & Bunch, 1953); Binder, combine, or swather (Wheeler, 1950; Hoover et al., 1948)
METHOD OF CLEANING: Process with hammermill and clean with a fanning mill (Wheeler, 1950; Hoover et al., 1948)

PRETREATMENT

METHOD OF STORAGE: Cold-dry, 5°C and 40% relative humidity(Canode, 1972; 1965)
DURATION OF GOOD VIABILITY: 10 years (Canode, 1972); 6-10 years (Hafenrichter et al., 1968); over 2 years (Wolff, 1951)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (McGinnies, 1960a); Fluctuating: 20-30°C, 15-25°C at 16-8 hours (AOSA, 1978)
MOISTURE: Optimum: Up to 7 1/2 atm (McGinnies, 1960a)
LIGHT: Light required at 20-30°C, optional at 15-25°C (AOSA, 1978)
GERMINATIVE ENERGY: 80% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 90% (Atkins & Smith, 1967); 86% (Cooper et al., 1957); 85% (Wheeler & Hill, 1957); 91% (Wolff, 1951; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1" (Archer & Bunch, 1953); 1/2" (McKenzie et al., 1946)
PLANTING TIME: Best results from spring seeding (Kilcher, 1961); Early fall (Frischknecht, 1951)
EXPOSURE: Not well adapted to shade (Plummer et al., 1955)
SOIL TEXTURE: Adapted to loamy (Heady, 1975); Sandy-good, silty-good, clayey-good (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967)
SOIL pH: Not tolerant to saline, saline-alkaline, or alkaline soils (Wheeler & Hill, 1957)
DEPTH: Deep (Plummer et al., 1955)
SOIL MOISTURE: Medium moisture requirement (Cooper et al., 1957); Does well on dry or moist sites (Hull & Johnson, 1955)
PRECIPITATION: 10-13" annual (Lang et al., 1975); Mean annual >14" (Hafenrichter et al., 1968); 15+" annual (Jefferies & Cardwell, 1964)
DRAINAGE: Well-drained (Hafenrichter et al., 1968); Must have good drainage (Wheeler & Hill, 1957)

AGROPYRON REPENS (L.) Beauv.
Quackgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 110,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Williams, 1971)
LIGHT: As many seeds germinate in the dark as in the light (Williams, 1971)
GERMINATIVE CAPACITY: 50% when fresh, 70% by the time the seeds are 6 months old (Kephart, 1923)

CULTURAL PRACTICES

PLANTING DEPTH: 2.5-5 cm (Williams, 1971)
SOIL TEXTURE: Grows equally well in sandy, clayey, or gravelly soils (Kephart, 1923)
SOIL MOISTURE: Moist (Forsling & Dayton, 1931)
COMMENTS: Noxious weed (Thornton et al., 1979)

AGROPYRON RIPARIUM Scribn. & Smith
Streambank Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 156,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: Aug 1-Sep 15 (Sampson, 1924)

PRETREATMENT

STRATIFICATION: KNO_3 and prechill 3 days (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C (Haferkamp & McSwain, 1951); Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

BEST DOCUMENT AVAILABLE

LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 95% (Wheeler & Hill, 1957)

CULTURAL PRACTICES

PLANTING DEPTH: Not greater than 1" (USDA, For. Ser., 1966)
PLANTING TIME: No preferred seeding date (Kilcher, 1961); Fall (Douglas et al., 1960)
SOIL TEXTURE: Moderately coarse to fine (USDA, For. Ser., 1966)
SOIL pH: Moderately saline to acidic (USDA, For. Ser., 1966)
SOIL DEPTH: Shallow to deep (USDA, For. Ser., 1966)
PRECIPITATION: 5-9" annual (Lang et al., 1975); Minimum mean annual, 12" below 3500' and 9" at higher elevations (Hafenrichter et al., 1968); 6" or more annual (USDA, For. Ser., 1966)

AGROPYRON SMITHII Rydb.
Western Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 7,115/oz, 250/g (AOSA, 1978); 243,000/kg (Heady, 1975); 126,000/lb (Vallentine, 1971; Atkins & Smith, 1967); 110,000/lb (Hafenrichter et al., 1968; Wheeler & Hill, 1957; Stefferud, 1948); 125,000/lb (Cooper et al., 1957); 100,000-125,000/lb (Hoover et al., 1947)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Late summer (Cooper et al., 1957); Late Aug and early Sep (Wheeler, 1950); Aug 1 in North, earlier in South (Hoover et al., 1947); Most seed matures by Sep (Sampson, 1924)
METHOD OF COLLECTION: Windrower (Atkins & Smith, 1967); Combine (Cooper et al., 1957); Combine, windrowing followed by pickup threshing, heading followed by stacking and threshing, stripper (Wheeler & Hill, 1957; Wolff, 1951); Combine directly or harvest with a binder or header or with a swather and pickup attachment (Archer & Bunch, 1953; Hoover et al., 1947)
METHOD OF CLEANING: Run seeds over a scalper to remove stemmy material; remove awns with a hammermill (Wheeler & Hill, 1957)

PRETREATMENT

DURATION OF GOOD VIABILITY: 2-4 years (Archer & Bunch, 1953); 4 years (Hull & Pearse, 1943a); 51 months (McAlister, 1943)
SCARIFICATION: Remove distal end of seed by cutting through the lemma and palea and a small portion of the caryopsis (Kinch, 1966)

LABORATORY GERMINATION

TEMPERATURE: Constant: 60°F (Knipe, 1973); Fluctuating: 18.5-10°C at 8-16 hours Sabo et al., 1979); 15-30°C at 16-8 hours (AOSA, 1978); 24-13°C at 12-12 hours (Bokhari et al., 1975); 60-80°F (Knipe, 1973); 20-30°C at 16-8 hours (USDA, 1952); 17-30°C, 20-30°C (Norris & Decker, 1944); 20-30°C at 18-6 hours (Hay, 1938)
MOISTURE: Optimum: 0 atm (Knipe, 1973); Lower Limit: -7 bars (Sabo et al., 1979; Bokhari et al., 1975)
LIGHT: Necessary (Sabo et al., 1979); White light inhibits germination, red light at 4- and 8-minute exposures stimulates germination (Schultz & Kinch, 1976); Germination promoted by red light (Toole, 1976); Germination inhibited by light (Mayer & Poljakoff-Mayber, 1975); Independent of light (Knipe, 1973); Higher germination percentages in dark (Delouche & Bass, 1954); Light required (USDA, 1952)
GERMINATIVE ENERGY: 86% in 30 days (Hay, 1938)
GERMINATIVE CAPACITY: 60% (Hafenrichter et al., 1968); 75% (Atkins & Smith, 1967); 56% (Cooper et al., 1957); 80% one year after harvest (Wheeler & Hill, 1957; Wolff, 1951); 70% (Archer & Bunch, 1953); 80% (Wheeler, 1950; Hoover et al., 1947); 50-80% (Hull & Pearse, 1943a)
COMMENTS: Moisten substratum with 0.2% KNO_3 or germinate in soil (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 3/4-1" (Allred & Nixon, 1955); 1/2-1" (McWilliams, 1955); 1" (Archer & Bunch, 1953); 1" (Stefferud, 1948); 3/4" (Plummer, 1943)
PLANTING TIME: Early fall (McWilliams, 1955); Sep-Oct, Feb-Mar (Stefferud, 1948)
EXPOSURE: Not highly shade tolerant (Plummer et al., 1955)
SOIL TEXTURE: Adapted to sandy, loamy clay (Heady, 1975); silty-good, clayey-good, sandy-poor (Vallentine, 1971); silt or clay (Atkins & Smith, 1967); Best adapted to clay (Donahue et al., 1956); Clay to loam (Allred & Nixon, 1955); Loam, clay (Stefferud, 1948); Fine textured soils, loams, silt loams, and clays (Stewart & Walker, 1939)
SOIL MOISTURE: Adapted to wet (Heady, 1975); High moisture requirement (Cooper et al., 1957); Moist (Hull & Johnson, 1955)
PRECIPITATION: 5-14" annual (Lang et al., 1975); 11-16" annual (Jefferies & Cardwell, 1964); In excess of 12" annual (Plummer et al., 1943)
DRAINAGE: Well-drained bottom lands (Johnson, 1976; Judd, 1962; USDA, For. Ser., 1937; Sampson, 1924)
COMMENTS: Greenhouse: Significant temperature level of moisture stress interaction (Knipe, 1973)

AGROPYRON SPICATUM (Pursh) Scribn. & Smith
Bluebunch Wheatgrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 117,000/lb (Vallentine, 1971); 142,640/lb (Plummer et al., 1968); 95,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)

SEED MATURITY: Jul 15-Sep 15 (Plummer et al., 1968); Mid Aug-Sep (Sampson, 1924)

METHOD OF COLLECTION: Hand collect or combine (Plummer et al., 1968); Harvest with a binder (Wheeler & Hill, 1957); Binder, combine, swather, hand strip, or sickle (Archer & Bunch, 1953; Hoover et al., 1948); Binder, combine, or swather (Wheeler, 1950)

METHOD OF CLEANING: Dry, chop, and fan (Plummer et al., 1968); Process with a hammermill (Archer & Bunch, 1953; Wheeler, 1950; Hoover et al., 1948); Mill threshed seed in a hammermill and clean it with a seed cleaner (Schwendiman et al., 1940)

PRETREATMENT

DURATION OF GOOD VIABILITY: 5 years (Hull & Pearse, 1943a)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C, 15-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

MOISTURE: Lower Limit: 6.1 atm (Choudhuri, 1968)

LIGHT: Light required (Haferkamp & McSwain, 1951)

GERMINATIVE CAPACITY: 90% (Wheeler & Hill, 1957); 85-90% (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4" (Plummer, 1943)

PLANTING TIME: Spring, fall under semiarid conditions (Wheeler & Hill, 1957); Spring (Archer & Bunch, 1953); Early fall (Frischknecht, 1951)

EXPOSURE: Slightly shale tolerant (Plummer et al., 1955)

SOIL TEXTURE: Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Silt loam (Wheeler & Hill, 1957); Light sandy loam (Stewart & Walker, 1939); Sandy loam (Sampson, 1924)

PRECIPITATION: 5-9" annual (Lang et al., 1975); 11-16" annual (Jefferies & Cardwell, 1964)

DRAINAGE: Well drained (Wheeler & Hill, 1957; Plummer et al., 1955; Plummer et al., 1943; Robertson & Pearse, 1943; Stewart & Walker, 1939; Sampson, 1924)

AGROPYRON SUBSECUNDUM (Link) Hitchc.
Bearded Wheatgrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 150,000/lb (Hafenrichter et al., 1968; Wheeler & Hill, 1957); 117,000/lb (Stefferud, 1948)

SEED MATURITY: Between Jul and Sep (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

LIGHT: Light required (Haferkamp & McSwain, 1951)

GERMINATIVE CAPACITY: 95% (Hafenrichter, et al., 1968); 96% (Wheeler & Hill, 1957)

CULTURAL PRACTICES

EXPOSURE: Shade tolerant (Plummer et al., 1955)

SOIL TEXTURE: Sandy (USDA, For. Ser., 1937; Sampson, 1924)

SOIL MOISTURE: Fairly moist (Sampson, 1924)

AGROPYRON TRACHYCAULUM (Link) Malte
Slender Wheatgrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 8,335/oz, 295/g (AOSA, 1978); 159,000/lb (Atkins & Smith, 1967; Stefferud, 1948); 125,000/lb (Cooper et al., 1957); 160,000 (Wheeler & Hill, 1957); 140,000-160,000/lb (Hoover et al., 1947)

SEED MATURITY: Jun 1-Jul 15 (Atkins & Smith, 1967); Late summer (Cooper et al., 1957); Mid-summer in northern part of range and somewhat earlier in southern part (Wheeler & Hill, 1957); Aug 1 in northern part of range, earlier in south (Hoover et al., 1947); Jun-Sep depending on latitude or elevation (USDA, For. Ser., 1937);

METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967; Cooper et al., 1957); Harvest with a binder by direct combining (Harmond et al., 1961); Harvest with combine or grain binder (Wheeler & Hill, 1957; Wheeler, 1950); Binder, combine, or swather (Hoover et al., 1948; Hoover et al., 1947)

METHOD OF CLEANING: Clean with a fanning mill (Hoover et al., 1948)

PRETREATMENT

DURATION OF GOOD VIABILITY: 6 years (Hafenrichter et al., 1968); 3 years (Hull & Pearse, 1943a)
STRATIFICATION: Prechill at 5°C or 10°C for 5 days (AOSA, 1978); Prechill at 2°C for 8 weeks (McDonough, 1970)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 17-22°C at 16-8 hours (McDonough, 1970)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 90% (Atkins & Smith, 1967); 83% (Cooper et al., 1957); 92% (Wheeler & Hill, 1957; Wheeler, 1950; Hoover et al., 1947); Above 90% (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1" (Stefferud, 1948)
PLANTING TIME: Early fall (Frischknecht, 1951)
SOIL TEXTURE: Medium-textured (Hafenrichter et al., 1968); Silt or clay (Atkins & Smith, 1967); Best on sandy loam (Donahue et al., 1956); Adapted to most soil types but does best on loamy soils (Wheeler, 1950); Sandy loam (Hoover et al., 1948; USDA, For. Ser., 1937); Medium to light texture (Stewart & Walker, 1939); Sandy (Sampson, 1924)
SOIL DEPTH: Deep (Hafenrichter et al., 1968)
SOIL MOISTURE: Moderately moist (Hull & Johnson, 1955; USDA, For. Ser., 1937); Medium moisture (Cooper et al., 1957)
PRECIPITATION: 10-14" annual (Lang et al., 1975); In excess of 14" (Mont. Agric. Exp. Sta., 1970; Plummer et al., 1943; Robertson & Pearse, 1943); Above 20" (Hull & Pearse, 1943b)
DRAINAGE: Well drained (Hafenrichter et al., 1968; Stewart & Walker, 1939; USDA For. Ser., 1937; Sampson, 1924)

AGROPYRON TRICHOPHORUM (Link) Richt.
Pubescent Wheatgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Hitchcock, 1971)

PROCUREMENT

SEEDS/UNIT WT: 200,000/kg (Heady, 1975); 90,000 (Vallentine, 1971); 4,680-5,445/oz, 165-190/g (AOSA, 1970); 100,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (McGinnies, 1960a); Fluctuating: 15-25°C, 20-30°C at 16-8 hours (AOSA, 1978)
MOISTURE: Optimum: up to 7 1/2 atm (McGinnies, 1960a)
LIGHT: Light required at 20-30°C, optional at 15-25°C (AOSA, 1978)
GERMINATIVE CAPACITY: 90% (Wheeler & Hill, 1957); 85% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1.3-2.5 cm (McGinnies, 1960b)
PLANTING TIME: Fall or early spring (Hafenrichter et al., 1968); Mid Apr-early May in northeastern CO (McGinnies, 1960b); Early fall (Frischnecht, 1951)
SOIL TEXTURE: Adapted to loamy, clay (Heady, 1975); Silty-good, sandy-good, clayey-good (Vallentine, 1971)
SOIL pH: Adapted to alkali (Heady, 1975)
SOIL DEPTH: Deep (Plummer et al., 1955)
PRECIPITATION: 10-14" annual (Lang et al., 1975); Mean annual 12" or more below 3,500 feet, at higher elevations 10" is adequate (Hafenrichter et al., 1968); 15+" annual (Jefferies & Cardwell, 1964)

AGROSTIS ALBA L.
Redtop

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 5,000,000/lb (Hafenrichter et al., 1968); 5,000,000+/lb (Wheeler & Hill, 1957); 4,990,000/lb (Stefferud, 1948)
SEED MATURITY: Mid Jun-mid Aug (DeFrance & Burger, 1962); Aug-Oct (Sampson, 1924)
METHOD OF COLLECTION: Combine or mow, cure and thresh (DeFrance & Burger, 1962); Harvest with binder or by direct combining or windrowing (Harmond et al., 1961); Harvest with combine, self-binders and threshers (Wheeler & Hill, 1957); Combine direct--or mow, swath, and thresh using a combine with pickup attachment--or bind and thresh (Archer & Bunch, 1953; Wheeler, 1950; Combine or bluegrass stripper (Wolff, 1951)
METHOD OF CLEANING: Run over vibrating scalper to remove coarse trash before final cleaning in the fanning or several-screen mill (Wolff, 1951)

PRETREATMENT

DURATION OF GOOD VIABILITY: At least 6 years (Wheeler & Hill, 1957; Wolff, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1970; USDA, 1952)
LIGHT: Light required (AOSA, 1970; USDA, 1952)

BEST DOCUMENT AVAILABLE

GERMINATIVE CAPACITY: 85% (Hafenrichter et al., 1968); 90% (DeFrance & Burger 1962; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: Not over 1/2" (Archer & Bunch, 1953)
PLANTING TIME: Late winter or early spring (Wheeler & Hill, 1957); Fall superior to spring (Ahlgren, 1949)
EXPOSURE: Not tolerant to shade (Frolik & Frolik, 1941; USDA, For. Ser., 1937)
SOIL TEXTURE: Clayey-good, silty-good, sandy-fair (Vallentine, 1971); Loam (Stefferud, 1948); Sandy or clay loams (USDA, For. Ser., 1937)
SOIL pH: Acid to neutral (Hafenrichter et al., 1968); Adapted to acid soils (DeFrance & Burger, 1962; Wheeler & Hill, 1957; Anderson, 1941; USDA, For. Ser., 1937; Sampson, 1913)
SOIL MOISTURE: Wet (Mont. Agric. Exp. Sta., 1970; Hafenrichter et al., 1968; Wheeler & Hill, 1957); Moist or wet (Anderson, 1941; USDA, For. Ser., 1937); Moist (Sampson, 1913)
DRAINAGE: Poorly drained (Keim & Newell, 1955; Sampson, 1913)

AGROSTIS EXARATA Trin.
Spike Redtop

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Between first week in Aug and early part of Sep (USDA, For. Ser., 1937; Sampson, 1924)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (USDA, For. Ser., 1937; Sampson, 1924)

AGROSTIS PALUSTRIS Huds.
Creeping Bentgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 383,115/oz, 13,515/g (AOSA, 1978); 7,800,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)

PRETREATMENT

STRATIFICATION: Prechill at 5° or 10°C for 7 days (AOSA, 1970)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-30°C, 10-30°C, 15-25°C at 16-8 hours (AOSA, 1978); 20-30°C at 16-8 hours (USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 90% (Stefferud, 1948)

CULTURAL PRACTICES

EXPOSURE: Tolerates partial shading but grows best in full sunlight (Beard, 1973)
SOIL TEXTURE: Tolerates wide range of soil types, best adapted to fine textured soil (Beard, 1973)
SOIL pH: 5.5-6.5 preferred (Beard, 1973)

AGROSTIS SCABRA Willd.
Winter Redtop

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Thrives under variety of moisture conditions (USDA, For. Ser., 1937)

ALOPECURUS AEQUALIS Sobol.
Shortawn Foxtail

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Shallow water or wet places (Morris et al., 1950)

ALOPECURUS ALPINUS J. E. Smith
Alpine Foxtail

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

BEST DOCUMENT AVAILABLE

ALOPECURUS GENICULATUS L.
Water Foxtail

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 2,268,000/lb (Stevens, 1932)

ALOPECURUS PRATENSIS L.
Meadow Foxtail

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Hitchcock, 1971)

PROCUREMENT

SEEDS/UNIT WT: 25,430/oz, 895/g (AOSA, 1978); 580,000/lb (Vallentine, 1971); 900,000/lb (Hafenrichter et al., 1968); 575,000/lb (Wheeler & Hill, 1957); 576,000/lb (Stefferud, 1948)
METHOD OF COLLECTION: Binder or direct combining (Harmond et al., 1961); Combine or hand strip (Lewis, 1958; Wheeler, 1950); Harvest with binder or combine (Wheeler & Hill, 1957); Binder, cure in shocks and thresh, mow and windrow and thresh, combine with pickup attachment, or combine direct when seed is mature (Archer & Bunch, 1953)
METHOD OF CLEANING: Difficult to clean (Mont. Agric. Exp. Sta., 1970)

PRETREATMENT

METHOD OF STORAGE: Cold-dry, 5°C and 40% relative humidity (Canode, 1972, 1965)
DURATION OF GOOD VIABILITY: At least 10 years (Canode, 1972); 10 years (Hafenrichter et al., 1968)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978, USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 80% (Hafenrichter et al., 1968; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: Not over 1/2" (Seamands & Kolp, 1973; Wheeler, 1950)
PLANTING TIME: Early spring (Hafenrichter et al., 1968); Fall and spring (Lewis, 1958); Spring (Archer & Bunch, 1953; Hoover et al., 1948)
EXPOSURE: Shade tolerant (Plummer et al., 1955); Endures shade fairly well (Piper, 1924)
SOIL TEXTURE: Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Loams and clays (Wheeler, 1950; Schoth, 1945)
SOIL pH: Strongly acid (Hafenrichter et al., 1968); 5.2-8.5 (Lewis, 1958); Good growth maintained up to pH of 8.5 (Wheeler & Hill, 1957)
SOIL MOISTURE: Very wet (Mont. Agric. Exp. Sta., 1970); Adapted to wet soils (Lewis, 1958); Wheeler & Hill, 1957); Moist to wet (Plummer et al., 1955); Moist or swampy (Wheeler, 1950; Schoth, 1945)
DRAINAGE: Adapted to poorly drained soils (Hafenrichter et al., 1968; Wheeler & Hill, 1957)

ANDROPOGON BARBINODIS Lag.
Cane Bluestem

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

METHOD OF COLLECTION: Harvest with stripper (Harmond et al., 1961)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4-1/2" (Allred & Nixon, 1955)
SOIL TEXTURE: Clay to loam (Allred & Nixon, 1955)
SOIL MOISTURE: Grows on dry soils (USDA, For. Ser., 1937)

ANDROPOGON GERARDI Vitman
Big Bluestem

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 9,015/oz, 320/g (AOSA, 1978); 420,000/kg (Heady, 1975); 130,000/lb (Vallentine, 1971; Atkins & Smith, 1967; Cooper et al., 1957); 160,000/lb (Wheeler & Hill, 1957); 165,000/lb (Stefferud, 1948); 140,000-170,000/lb (Hoover et al., 1947)
SEED MATURITY: Sep 1-Oct 1 (Atkins & Smith, 1967); Late Sep and Oct (Hawk & Schwendiman, 1962; Archer & Bunch, 1953; Wheeler, 1950; Hoover et al., 1948; Hoover et al., 1947); Late fall (Cooper et al., 1957)

METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967; Cooper et al., 1957); Direct combining or binder (Harmond et al., 1961); Combine, power stripper, or binder (Wheeler & Hill, 1957; Wheeler, 1950); Grain combine (Archer & Bunch, 1953); Small combine or cut with grain binder, shock, cure and thresh with stationary combine or threshing unit (Wolff, 1951); Binder or small-grain combine (Hoover et al., 1948; Hoover et al., 1947)

METHOD OF CLEANING: Process with hammermill and clean with fanning mill (Wheeler & Hill, 1957; Wolff, 1951; Wheeler, 1950; Hoover et al., 1947); Hammermill (Weber, 1939)

PRETREATMENT

METHOD OF STORAGE: Jars in cold storage (Coukos, 1944)

DURATION OF GOOD VIABILITY: 3 years (Wheeler & Hill, 1957; Wolff, 1951); 8 years (McWilliams, 1950); 28-40 months (Coukos, 1944); 5 years (Blake, 1935)

STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1978; USDA, 1952)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 17-30°C, 20-30°C (Norris & Decker, 1944)

LIGHT: Light required (AOSA, 1978; USDA, 1952)

GERMINATIVE ENERGY: 31% for trashy units, 82% for grain in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 60% (Atkins & Smith, 1967; Wheeler, 1950; Stefferud, 1948; Hoover et al., 1947); 50% (Cooper et al., 1957)

COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Allred & Nixon, 1955; McWilliams, 1955); Not more than 1/2" (Wheeler, 1950; Hoover, 1939); 1/2-1" (Stefferud, 1948)

PLANTING TIME: May 10 (McWilliams, 1955); Dec 1-Jun 1 (Archer & Bunch, 1953); Mar-Apr (Stefferud, 1948)

SOIL TEXTURE: Adapted to sandy, loamy, clay (Heady, 1975); silty-good, sandy-fair, clayey-fair (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967); Clay to sand (Allred & Nixon, 1955); Rich loam (Stefferud, 1948)

SOIL MOISTURE: Moist (Hawk & Schwendiman, 1962; Frolik & Frolik, 1941; Frolik & Keim, 1938); High moisture requirement (Cooper et al., 1957); 1/2-2/3 saturation (Blake, 1935)

PRECIPITATION: 15+ annual (Lang et al., 1975)

DRAINAGE: Well drained (Hawk & Schwendiman, 1962; Frolik & Frolik, 1941; Frolik & Keim, 1938)

COMMENTS: Greenhouse: Most seedlings produced when seeds planted the second year after harvest (Robocker et al., 1953)

ANDROPOGON HALLII Hack.
Sand Bluestem

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 6,040/oz, 215/g (AOSA, 1978); 275,000/kg (Heady, 1975); 113,000/lb (Vallentine, 1971, Atkins & Smith, 1967; Stefferud, 1948); 110,000/lb (Cooper et al., 1957; Wheeler & Hill, 1957) 105,000-122,000/lb (Hoover et al., 1947)

SEED MATURITY: Sep 1-Oct 30 (Atkins & Smith, 1967); Late fall (Cooper et al., 1957); Late Sep or Oct (Archer & Bunch, 1953; Wheeler, 1950; Hoover et al., 1947)

METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967; Cooper et al., 1957); Binder or direct combining (Harmond et al., 1961); Harvest with combine (Wheeler & Hill, 1957; Wolff, 1951; Wheeler, 1950); Best to combine direct, binding is satisfactory (Hoover et al., 1947)

METHOD OF CLEANING: Use scalper or fanning mill (Wheeler & Hill, 1957; Wolff, 1951)

PRETREATMENT

DURATION OF GOOD VIABILITY: Over 3 years (Wheeler & Hill, 1957); 8 years (McWilliams, 1950)

STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1970; USDA, 1952)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)

LIGHT: Light required (AOSA, 1978; USDA, 1952)

GERMINATIVE ENERGY: 50% in 7 days (Wheeler & Hill, 1957); 48% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 60% (Cooper et al., 1957; Wheeler & Hill, 1957; Archer & Bunch, 1953; Wheeler, 1950; Stefferud, 1948; Hoover et al., 1947)

COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Allred & Nixon, 1955); 1/2-1" (Stefferud, 1948)

PLANTING TIME: Dec 1-Jun (Archer & Bunch, 1953)

SOIL TEXTURE: Sandy (Ohlenbusch, 1976; Hawk & Schwendiman, 1962; Judd, 1962; Archer & Bunch, 1953; Frolik & Keim, 1938);

Adapted to sand (Heady, 1975; Stefferud, 1948); Sandy-good, silty-fair, clayey-poor (Vallentine, 1971); Sand (Atkins & Smith, 1967); Sandy clay to sand (Allred & Nixon, 1955)
SOIL DEPTH: Deep (Hawk & Schwendiman, 1962; Archer & Bunch, 1953; Wheeler, 1950; Stefferud, 1948)
SOIL MOISTURE: Low moisture requirement (Cooper et al., 1957)
PRECIPITATION: 15+" annual (Lang et al., 1975)

ANDROPOGON SACCHAROIDES Swartz
Silver Bluestem

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 384,000/lb (Flory & Marshall, 1942); 515,000/lb (Mirov, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL TEXTURE: Loam (Stefferud, 1948)

ANDROPOGON SCOPARIUS Michx.
Little Bluestem

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 14,855/oz, 525/g (AOSA, 1978); 835,000/kg (Heady, 1975); 255,000/lb (Vallentine, 1971; Atkins & Smith, 1967)
SEED MATURITY: Sep 1-Oct 30 (Atkins & Smith, 1967); Late fall (Cooper et al., 1957); Sep in northern Great Plains to Nov in South (Wheeler & Hill, 1957); Late Sep and Oct (Donahue et al., 1956; Hoover et al., 1948); Aug and Sep (Wheeler, 1950)
METHOD OF COLLECTION: Combine (Atkins & Smith, 1967; Cooper et al., 1957; Archer & Bunch, 1953); Direct combining or stripper (Harmond et al., 1961); Harvest with combine, binder, or by hand (Wheeler & Hill, 1957; Wolff, 1951); Direct combining, binder, swather and a pickup combine, power stripper, or small grain combine harvester (Wheeler, 1950); Stripping and threshing (Frolik & Keim, 1938); Binder, combine, or swather (Hoover et al., 1948; Hoover et al., 1947)
METHOD OF CLEANING: Hammermill, fanning mill, or scalper (Wheeler & Hill, 1957; Wolff, 1951); Clipper fanning mill (Wheeler, 1950); Process with hammermill and clean with a fanning mill (Hoover et al., 1948; Hoover et al., 1947)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Wheeler & Hill, 1957; Wolff, 1951); 8 years (McWilliams, 1950); 35-38 months (Coukos, 1944); 5 years (Blake, 1935)
STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1978; USDA, 1952)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 27-16.5°C at 8-16 hours (Sabo et al., 1979); 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 17-30°C, 20-30°C (Norris & Decker, 1944)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE ENERGY: 30% in 7 days (Wheeler & Hill, 1957); 31% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 60% (Atkins & Smith, 1967; Stefferud, 1948; Hoover et al., 1947); 50% (Wheeler & Hill, 1957; Cooper et al., 1957); 48% (Wolff, 1951)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Allred & Nixon, 1955); 1/2-1" (Stefferud, 1948)
PLANTING TIME: Dec-Jun (Archer & Bunch, 1953); Mar-Apr (Stefferud, 1948)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Sandy-good, silty-good, clayey-good (Vallentine, 1971); Sand, silt, or clay (Atkins & Smith, 1967); Clay to sand (Allred & Nixon, 1955)
SOIL MOISTURE: High moisture requirement (Cooper et al., 1957); 2/3 saturation (Blake, 1935)
PRECIPITATION: 15+" annual (Lang et al., 1975)
COMMENTS: Greenhouse: Most seedlings produced when seeds planted the year after harvest (Robocker et al., 1953)

ARISTIDA DIVARICATA Humb. & Bonpl.
Poverty Threeawn

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: May and Jun (Sampson & Chase, 1927)

ARISTIDA LONGISETA Steud.
Red Threeawn

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy soils (Morris et al., 1950; USDA, For. Ser., 1937); Sandy loam (Stefferud, 1948)
SOIL MOISTURE: Dry soils (Morris et al., 1950; USDA, For. Ser., 1937)

ARISTIDA PURPUREA Nutt.
Purple Threeawn

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Mostly in May (Sampson & Chase, 1927)

LABORATORY GERMINATION

TEMPERATURE: Constant: room temperature (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL TEXTURE: Sand (Stefferud, 1948)

ARRHENATHERUM ELATIUS (L.) Presl.
Tall Oatgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 11,820/oz, 420/g (AOSA, 1978); 330,000/kg (Heady, 1975); 150,000/lb (Vallentine, 1971; Wheeler & Hill, 1957; Stefferud, 1948)
METHOD OF COLLECTION: Higher seed yields obtained by binding (Hafenrichter et al., 1968); Harvest with binder or by direct combining (Harmond et al., 1961)
METHOD OF CLEANING: Mill threshed seed in hammermill and clean with a seed cleaner (Schwendiman et al., 1940)

PRETREATMENT

METHOD OF STORAGE: Cold-dry, 5°C and 40% relative humidity (Canode, 1972)
DURATION OF GOOD VIABILITY: At least 10 years (Canode, 1972); 3 years (Hull & Pearse, 1943a)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978, USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 80% (Stefferud, 1948); 80-90% (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: No deeper than 1" (Rogler et al., 1961); 1-1 1/2" (Keim & Newell, 1962); 3/4" (Plummer, 1943); 1" in moist soil, 1 1/2" in dry soil (Piper, 1924)
PLANTING TIME: Sep or early Oct in regions of ample autumn or late summer moisture and where winters are not severe, otherwise spring (Archer & Bunch, 1953; Hoover et al., 1948); Early fall (Frischknecht, 1951); Late summer and early fall (Hull, 1948)
EXPOSURE: Highly shade tolerant (Hafenrichter et al., 1968; Plummer et al., 1955); Does not grow well in shade (Keim & Newell, 1955; Piper, 1922; Wheeler, 1950); Tolerant to shade (Archer & Bunch, 1953); Unadapted to shady conditions (Ahlgren, 1949); Will not endure shade (Stewart & Walker, 1939)
SOIL TEXTURE: Adapted to loamy (Heady, 1975); Sandy-good, silty-good, clayey-good (Vallentine, 1971); Loam, light sandy or gravelly (Keim & Newell, 1955); Sandy or gravelly preferred (Archer & Bunch, 1953; Wheeler, 1950; Piper, 1922); Light sandy or gravelly (Hoover et al., 1948); Thrives on loam, also succeeds on sandy and gravelly soils (Stewart & Walker, 1939; Piper, 1924)
SOIL DEPTH: Prefers deep (Stewart & Walker, 1939; Piper 1924)
SOIL MOISTURE: Adapted to wet (Heady, 1975); Unadapted to wet soils (Ahlgren, 1949)
PRECIPITATION: 15+" (Hull & Pearse, 1943b)
DRAINAGE: Well drained (Hafenrichter et al., 1968; Keim & Newell, 1955; Hoover et al., 1948; Piper, 1922); Reasonably good drainage (Wheeler & Hill, 1957); Well drained preferred (Archer & Bunch, 1953; Wheeler, 1950; Stewart & Walker, 1939)

AVENA FATUA L.
Wild Oat

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 25,890/lb (Stevens, 1932)
SEED MATURITY: Between Apr and Jun in south-central California, later farther north (Sampson, 1924)

PRETREATMENT

SCARIFICATION: Percent germination increased by lengthening imbibition in sodium azide from 3 to 6 hours and increasing azide concentration from 0.5 to 1.0 m M provided seed were imbibed less than 14 days (Fay & Gorecki, 1978); Puncture seed coat with needle (Hay, 1962, 1958); Remove lemma and palea (Black, 1959; Atwood, 1914)

LABORATORY GERMINATION

TEMPERATURE: Constant: 10-21°C (Sharma et al., 1976); Fluctuating: 15-25°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Germination promoted by white light in higher volumes of water--inhibited by white, blue, red, and far-red in low volumes of water (I-Hsiao & Simpson, 1971); Germination inhibited by light (Hart & Berrie, 1966; Hay, 1963, 1962; Hay & Cumming, 1959; Cumming & Hay, 1958; Black & Naylor, 1957; Cumming, 1957); Germination unaffected by light (Atwood, 1914)
GERMINATIVE CAPACITY: 94% in 18 days (Sharma et al., 1976)

CULTURAL PRACTICES

PLANTING DEPTH: 2-6 cm (Sharma et al., 1976)
SOIL TEXTURE: Many kinds of soils--such as, clay loam, sandy lands, and stiff adobe--best yields on adobe (Sampson & Chase, 1927)
SOIL MOISTURE: Best emergence from 50% and 75% field capacity (Sharma et al., 1976)
COMMENTS: Sodium azide, if used, must be incorporated when soil is moist (Fay & Gorecki, 1978); Noxious (Thornton et al., 1974)

BECKMANNIA SYZIGACHNE (Steud.) Fernald
American Sloughgrass

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 1,512,000/lb (Stevens, 1932)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Morris et al., 1950)

BLEPHARONEURON TRICHOLEPIS (Torr.) Nash
Pine Dropseed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Rocky (Judd, 1962)
SOIL MOISTURE: Moderately dry (Judd, 1962)

BOUTELOUA CURTIPENDULA (Michx.) Torr.
Sideoats Grama

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 45,640/oz (AOSA, 1978); 315,000/kg (Heady, 1975); 191,000/lb (Vallentine, 1971; Atkins & Smith, 1967); 200,000/lb (Wheeler & Hill, 1957); 191,000/lb (Stefferud, 1948)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Late summer (Cooper et al., 1957); Jul 1-Oct 1 (Wheeler & Hill, 1957); Late Aug or Sep (Archer & Bunch, 1953); About mid summer (Hoover et al., 1948); Some time after mid summer (Hoover et al., 1947)
METHOD OF COLLECTION: Combine preferred, also windrower (Atkins & Smith, 1967); Stripper or direct combining (Harmond et al., 1961); Combine (Cooper et al., 1957); Harvest with combine, binder, or bluegrass stripper (Wheeler & Hill, 1957; Wolff, 1951); Direct combining, binding, or windrowing plus pickup combining (Archer & Bunch, 1953; Hoover et al., 1947); Grass seed stripper, small combine, or grass binder (Wheeler, 1950); Binder or small-grain combine (Hoover et al., 1948)
METHOD OF CLEANING: Fanning mill (Wheeler & Hill, 1957; Hoover et al., 1948); Scalper screen or fanning mill (Archer & Bunch, 1953; Wolff, 1951; Hoover et al., 1947)

PRETREATMENT

DURATION OF GOOD VIABILITY: 8 years (McWilliams, 1950); Greater than 38 months (Coukos, 1944)
SCARIFICATION: Treat with 5.24% sodium hypochlorite for 1/2 hour then wash seed in running tap water for 2 hours and air dry at room temperature for 24 hours (Sumner & Cobb, 1962)

LABORATORY GERMINATION

TEMPERATURE: Constant: 23°C (Sabo et al., 1979); 20°C (Toole, 1938); Fluctuating: 12-31°C at 8-16 hours (Sabo et al., 1979); 15-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 20-30°C at 16-8 hours or 15-30°C at 12-12 hours (Cole et al., 1974); 17-30°C, 20-30°C (Norris & Decker, 1944); 20-30°C, 10-35°C, 10-30°C, 15-25°C at 18-6 hours (Toole, 1938)

LIGHT: Light required (AOSA, 1978; USDA, 1952)

GERMINATIVE ENERGY: 51-65% in 7 days (Wheeler & Hill, 1957; Wolff, 1951)

GERMINATIVE CAPACITY: 70% (Atkins & Smith, 1967); 58% (Cooper et al., 1957); 58-85% (Wheeler & Hill, 1957; Wolff 1951); 65% (Stefferud, 1948; Hoover et al., 1947)

COMMENTS: Moisten substratum with 0.2% KNO$_3$ (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-3/4" (Allred & Nixon, 1955); 1/4-1/2" (McWilliams, 1955); 1/2-1" (Allred, 1950; Stefferud, 1948)

PLANTING TIME: Apr 20 (McWilliams, 1955); Mar-Apr (Stefferud, 1948)

SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Sand, silt, or clay (Atkins & Smith, 1967); Clay to sand (Allred & Nixon, 1955); Rocky, sandy loam (Stefferud, 1948)

SOIL MOISTURE: Low moisture requirement (Cooper et al., 1957); Dry (Frolik & Keim, 1938), 1/2 saturation (Blake, 1935)

PRECIPITATION: 15+" annual (Lang et al., 1975)

COMMENTS: Greenhouse: Most seedlings produced when seeds are planted one year after harvest (Robocker et al., 1953)

BOUTELOUA ERIOPODA (Torr.) Torr.
Black Grama

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 1,335,000/lb (Vallentine, 1971; Wheeler & Hill, 1957; Stefferud, 1948)

SEED MATURITY: By or during the last two weeks of Oct (Wheeler & Hill, 1957)

METHOD OF COLLECTION: Harvest with a seed stripper (Wheeler & Hill, 1957: Wolff, 1951)

METHOD OF CLEANING: Vibrating scalper or fanning mill, hammermill may be used to follow the fanning mill (Wheeler & Hill, 1957; Wolff, 1951)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 or 4 years (Wheeler & Hill, 1957; Wolff, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (Wright & Baltensperger, 1964) room temperature to 35°C (Toole, 1938)

MOISTURE: Lower Limit: Greater than 20 atm (Knipe & Herbel, 1960)

LIGHT: Seed germinates more rapidly in dark (Wright & Baltensperger, 1964)

GERMINATIVE ENERGY: 10% in 7 days (Wheeler & Hill, 1957); 11% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 20% (Wheeler & Hill, 1957); 22% (Wolff, 1951; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Stefferud, 1948)

EXPOSURE: Very intolerant to shade (USDA, For. Ser., 1937)

SOIL TEXTURE: Sandy-good, silty-good, clayey-poor (Vallentine, 1971); Best adapted to sandy and gravelly (Archer & Bunch, 1953; Wheeler, 1950); Fine sandy loam (Stefferud, 1948); Loam (Bridges, 1942); Gravelly or sandy soils (USDA, For. Ser., 1937)

DRAINAGE: Best adapted to well drained (Archer & Bunch, 1953)

BOUTELOUA GRACILIS (H.B.K.) Lag. ex Steud
Blue Grama

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 45,275/oz, 1,595/g (AOSA, 1978); 1,570,000/kg (Heady, 1975) 711,000/lb (Vallentine, 1971; Atkins & Smith, 1967); 700,000/lb (Cooper et al., 1957); 850,000/lb (Wheeler & Hill, 1957); 825,000/lb (Stefferud, 1948); 800,000-825,000/lb (Hoover et al., 1947)

SEED MATURITY: Sep 1-Oct 30 (Atkins & Smith, 1967); Sometime after early Aug (Donahue et al., 1956; Wheeler & Hill, 1957; Archer & Bunch, 1953; Hoover et al., 1947); Early fall (Cooper et al., 1957); Aug (Hoover et al., 1948); Between Jun and Sep (Sampson, 1924)

METHOD OF COLLECTION: Combine preferred, also windrower (Atkins & Smith, 1967); Stripper or direct combining (Harmond et al., 1961); Combine preferred, also stripper (Cooper et al., 1957); Direct combining is satisfactory, windrowers and bluegrass strippers can also be used (Wheeler & Hill, 1957); Direct combining, swathing followed by pickup combining, and seed strippers (Archer & Bunch, 1953); Bluegrass stripper, small combine, or header and thresher (Wheeler, 1950); Direct combining and swathing followed by pickup combining (Hoover et al., 1948; Hoover et al., 1947)

METHOD OF CLEANING: Aspirator (Briske & Wilson, 1977); Scalper or hammermill (Wheeler & Hill, 1957); Scalper screen or fanning mill (Archer & Bunch, 1953; Hoover et al., 1947); Fanning mill (Hoover et al., 1948); Hammermill (Weber, 1939)

PRETREATMENT

DURATION OF GOOD VIABILITY: At least 7 years (Thornton & Thornton, 1962); About 4 years (Wheeler & Hill, 1957); 8 years (McWilliams, 1950)

LABORATORY GERMINATION

TEMPERATURE: Constant: 60-100°F (Knipe, 1967); Fluctuating: 27 to 37-35 to 37°C at 8-16 hours (Sabo et al., 1979); 20-30°C at 16-8 hours (AOSA, 1978); 29.5-18°C at 12-12 hours (Bokhari et al., 1975); 17-30°C, 20-30°C (Norris & Decker, 1944); 20-30°C, 15-25°C at 18-6 hours (Toole, 1938)

MOISTURE: Optimum: 0-7 atm (Knipe, 1968); Lower Limit: -10 bars (Sabo et al., 1979); -11 bars (Bokhari et al., 1975)

LIGHT: Light required (AOSA, 1978)

GERMINATIVE ENERGY: 60% in 7 days (Wheeler & Hill, 1957)

GERMINATIVE CAPACITY: 70% (Atkins & Smith, 1967); 60% (Cooper et al., 1957); 65% (Wheeler & Hill, 1957); 75% (Archer & Bunch, 1953; Stefferud, 1948; Hoover et al., 1947)

COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-3/4" (Allred & Nixon 1955); 1/4 & 1/2" (McWilliams, 1955; Riegel, 1941); 1/2-1" (Wheeler, 1950); 1/2" (Stefferud, 1948)

PLANTING TIME: Apr 20 and May 10 (McWilliams, 1955); Dec-Jun (Archer & Bunch, 1953)

SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967); Grows best on relatively fine textured soils but does well on sandy soils (Keim & Newell, 1962); Clay to sandy loam (Allred & Nixon, 1955); Loam, clay (Stefferud, 1948)

SOIL pH: Adapted to alkali (Heady, 1975)

SOIL MOISTURE: Low moisture requirement (Cooper et al., 1957); Dry (Frolik & Keim, 1938)

BOUTELOUA HIRSUTA Lag.
Hairy Grama

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 980,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)

SEED MATURITY: Last two weeks in Sep (Wheeler & Hill, 1957); From last week in Aug until forepart of Oct (Sampson, 1924)

METHOD OF COLLECTION: Harvest with combine or stripper (Wheeler & Hill, 1957; Wolff, 1951); Combine (Archer & Bunch, 1953)

METHOD OF CLEANING: Use scalper and/or hammermill (Wheeler & Hill, 1957; Wolff, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

GERMINATIVE ENERGY: 13% in 7 days (Wheeler & Hill, 1957; Wolff, 1951)

GERMINATIVE CAPACITY: 39% (Wheeler & Hill, 1957; Wolff, 1951; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4-1/2" (Allred & Nixon, 1955); 1/2" (Archer & Bunch, 1953)

PLANTING TIME: Feb, Mar, and Apr (Archer & Bunch, 1953)

SOIL TEXTURE: Best growth on stable sandy loams (Judd, 1962); Clay to loam (Allred & Nixon, 1955); Rocky, sandy loam (Stefferud, 1948); Sandy and sandy loam (USDA, For. Ser., 1937)

SOIL MOISTURE: Dry (Frolik & Keim, 1938; USDA, For. Ser., 1937)

DRAINAGE: Well drained (Sampson, 1924)

BROMUS BRIZAEFORMIS Fisch. & Mey.
Rattlesnake Brome

FAMILY: Gramineae

LIFE FORM: Annual introduced grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Jun (Sampson & Chase, 1927)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)

BROMUS CARINATUS Hook. & Arn.
California Brome

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 70,000/lb (Wheeler & Hill, 1957); 61,000/lb (Mirov & Kraebel, 1937)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1 1/2" (Plummer, 1943)

PLANTING TIME: Early fall (Frischknecht, 1951)

SOIL TEXTURE: Best growth in loamy soils (Sampson, 1924)

SOIL DEPTH: Deep preferred (Judd, 1962)

SOIL MOISTURE: Moderately moist preferred (Judd, 1962); Best growth in fairly moist soils (Sampson, 1924)

PRECIPITATION: Above 15" annual (Hull & Pearse, 1943b)

BEST DOCUMENT AVAILABLE

BROMUS CATHARTICUS Vahl.
Rescuegrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 3,230/oz, 113/g (AOSA, 1978); 62,000/lb (Hafenrichter et al., 1968; Stefferud, 1948); 60,000/lb (Wheeler & Hill, 1957)
SEED MATURITY: Jun 15-Aug 1 (Sampson, 1924)
METHOD OF COLLECTION: Harvest with a combine or by binding and threshing (Wheeler & Hill, 1957); Combine, bluegrass and two-reeled strippers, or lawnmower rigged to strip the stems and shielded to catch shattered florets (Wolff, 1951)
METHOD OF CLEANING: Process with a hammermill run at about 1/3 the speed for grinding feed (Wheeler & Hill, 1957); fanning mill (Hamilton & Wooton, 1950)

PRETREATMENT

DURATION OF GOOD VIABILITY: High quality seed may remain viable for 4-5 years (Wheeler & Hill, 1957); 5 years (Wolff, 1951)
SCARIFICATION: Clip off distal end of caryopsis (Larson et al., 1973)

LABORATORY GERMINATION

TEMPERATURE: Constant: 26-30°C (Larsen et al., 1973); Fluctuating: 10-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 10-25°C at 12-12 hours (Larsen et al., 1973)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE ENERGY: 38% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 85% (Hafenrichter et al., 1968; Wolff, 1951; Stefferud, 1948); 85-90% (Wheeler &Hill, 1957)

CULTURAL PRACTICES

PLANTING TIME: Spring (Piper, 1934)
EXPOSURE: Somewhat tolerant of shade (Sampson et al., 1951)
SOIL MOISTURE: Best growth in medium-moist soils (Sampson, 1924)
DRAINAGE: Well-drained (Hafenrichter et al., 1968)

BROMUS CILIATUS L.
Fringed Brome

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

MOISTURE: Reasonably moist (USDA, For. Ser., 1937)

BROMUS INERMIS Leyss.
Smooth Brome

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 8,475-9,385/oz, 300-330/g (AOSA, 1978); 275,000/kg (Heady, 1975); 145,000/lb (Vallentine, 1971; Atkins & Smith, 1967; Cooper et al., 1957); 135,000/lb (Wheeler & Hill, 1957); 179,000-200,000/lb (Hoover et al., 1948); 136,000/lb (Stefferud, 1948)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Early summer (Cooper et al., 1957); Early Jul in IL (Wheeler & Hill, 1957); Mid summer (Hoover et al., 1948; Hoover et al., 1947)
METHOD OF COLLECTION: Combine preferred, also windrower (Atkins & Smith, 1967); Binder or combine (Newell & Anderson, 1962; Archer & Bunch, 1953; Wolff, 1951; Churchill, 1944); Combine preferred, also binder (Cooper et al., 1957; Wheeler, 1950); Direct combining, binder if crop badly lodged (Harmond et al., 1961); Harvest with a combine (Wheeler & Hill, 1957); Binder or small-grain combine (Hoover et al., 1948; Hoover et al., 1947; Frolik & Newell, 1941)
METHOD OF CLEANING: Fanning mill or three-screen mill (Wolff, 1951); Fanning mill (Hoover et al., 1948; Hoover et al., 1947; Churchill, 1944; Frolik & Newell, 1941)

PRETREATMENT

METHOD OF STORAGE: Store at 5°C with 40% relative humidity (Canode, 1965); Moisture content should be reduced to <12% (Grabe, 1957)
DURATION OF GOOD VIABILITY: At least 14 years (Rincker & Maguire, 1979); About 4 years (Wheeler & Hill, 1957; Wolff, 1951; 5 years (McWilliams, 1950; Hull & Pearse, 1943a); 22 months (McAlister, 1943)
STRATIFICATION: Prechill 5 days at 10°C (Grabe, 1955; Grabe & Bass, 1954)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (McGinnies, 1973, 1960a); Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)

MOISTURE: Optimum: up to 7 1/2 atm (McGinnies, 1960a)
LIGHT: Light optional (AOSA, 1978; USDA, 1952); Light beneficial (Grabe & Bass, 1954)
GERMINATIVE ENERGY: 50% in 7 days (Grabe, 1956); 65% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 83% (Atkins & Smith, 1967); 81% (Cooper et al., 1957); 80-90% (Wheeler & Hill, 1957); 90% (Keim & Newell, 1955); 90% (Archer & Bunch, 1953; Hoover et al., 1947); 85% (Wolff, 1951; Stefferud, 1948); 85% to above 95% (Hull & Pearse, 1943a)

CULUTRAL PRACTICES

PLANTING DEPTH: No deeper than 1" (Rogler et al., 1961); 1/2-1" (McWilliams, 1955); 1/2-3/4" (Archer & Bunch, 1953; Frolik & Newell, 1941); 1/4-1/2" (Wheeler, 1950); 1/2" (McKenzie et al., 1946)
PLANTING TIME: Fall (Newell & Anderson, 1962); Apr 1 (McGinnies, 1960b); Sep 5 (McWilliams, 1955); Early fall (Archer & Bunch, 1953; Frischknecht, 1951); Spring or late fall (USDA, For. Ser., 1937)
EXPOSURE: Tolerates shade (Plummer et al., 1968); Grows well in shade or sun (Plummer et al., 1955)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-good to fair (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967); Silt loams or clay loams (Newell & Anderson, 1962); Deep silt loams are best, also light sandy soils (Wheeler, 1950; Frolik & Newell, 1941); Clay loam (Hoover et al., 1948; USDA, For. Ser., 1937); Loams and clay loams (Anderson, 1941); Prefers rich loams and clay loams but will succeed on sandy soils (Stewart & Walker, 1939; Piper, 1934, 1924)
SOIL DEPTH: Deep (Beard, 1973; Newell & Anderson, 1962); Not too shallow (Forsling & Dayton, 1931); Rather deep (USDA, For. Ser., 1937)
SOIL MOISTURE: Adapted to wet (Heady, 1975); High moisture requirement (Cooper et al., 1957); Moist (Hull & Johnson, 1955; Hoover et al., 1948; USDA, For. Ser., 1937); Fairly moist (Forsling & Dayton, 1931)
PRECIPITATION: 15+" annual (Lang et al., 1975; Jefferies & Cardwell, 1964); Mean annual >15" (Hafenrichter et al., 1968); 11" annual is minimum limit (Plummer et al., 1968); Above 18" a year (Hull & Pearse, 1943b)
DRAINAGE: Well drained (Beard, 1973; Hafenrichter et al., 1968; Newell & Anderson, 1962; Hoover et al., 1948)

BROMUS JAPONICUS Thunb.
Japanese Brome

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

BROMUS MARGINATUS Nees
Mountain Brome

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 4,005/oz, 140/g (AOSA, 1978); 198,000/kg (Heady, 1975); 70,000/lb (Vallentine, 1971); 60,475/lb (Plummer et al., 1968); 70,000/lb (Wheeler & Hill, 1957); 71,000/lb (Stefferud, 1948)
SEED MATURITY: Aug 1-Sep 15 (Plummer et al., 1968); Mid summer (Hoover et al., 1948)
METHOD OF COLLECTION: Combine or hand collect (Plummer et al., 1968); Binding or shocking and threshing (Wheeler & Hill, 1957); Harvest with a binder or small-grain combine (Archer & Bunch, 1953; Hoover et al., 1948)
METHOD OF CLEANING: Dry and fan (Plummer et al., 1968); Fanning mill (Archer & Bunch, 1953; Hoover et al., 1948)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Hafenrichter et al., 1968); 4 years (Hull & Pearse, 1943a); >58 months (McAlister, 1943)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 85% (Stefferud, 1948); 90% (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING TIME: Apr & May (Archer & Bunch, 1953); In spring before May 10 (Wheeler, 1950)
SOIL TEXTURE: Adapted to loamy, clayey (Heady, 1975); Silty-good, clayey-good, sandy-poor (Vallentine, 1971); Grows best in loam soils but will grow in clay and sandy loams (Bridges, 1942; Stewart & Walker, 1939)

SOIL MOISTURE: Grows best in fairly moist but will grow in moderately dry (Bridges, 1942; Stewart & Walker, 1939)
COMMENTS: Field: Treat seed with fungicide before planting because of susceptibility to head smut (Hafenrichter et al., 1968)

BROMUS MOLLIS L.
Soft Chess

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Hitchcock, 1971)

PROCUREMENT

SEEDS/UNIT WT: 4,005/oz, 140/g (AOSA, 1978)

PRETREATMENT

STRATIFICATION: Prechill at 5° or 10°C for 7 days (AOSA, 1970)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978); 2°C or higher for 16 hours, 20, 25 or 30°C for 8 hours (Young et al., 1973)
LIGHT: Light required (AOSA, 1978)

BROMUS POLYANTHUS Scribn.
Foothill Brome

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

DURATION OF GOOD VIABILITY: Greater than 58 months (McAlister, 1943)

BROMUS PUMPELLIANUS Scribn.
Pumpelly's Bromegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Aug 15-Sep 10 at higher elevations, earlier at lower elevations (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Constant: 75°F & 85°F (Johnston, 1961)

CULTURAL PRACTICES

PLANTING DEPTH: Shallow (Johnston, 1961)
SOIL MOISTURE: Best growth on moderately moist soils (Sampson, 1924)

BROMUS RIGIDUS Roth
Ripgut

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Hitchcock, 1971)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: Optimum at relatively cool temperatures (Young et al., 1973)

BROMUS SECALINUS L.
Chess

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 71,000/lb (Stefferud, 1948)

PRETREATMENT

STRATIFICATION: Prechill at 5°C for 5-7 days (Steinbauer & Grigsby, 1957); Chill 3 days (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C for dormant seed, 20°-25°C after primary dormancy has passed (Steinbauer & Grigsby, 1957); Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light not required (Steinbauer & Grigsby, 1957); Light required (Haferkamp & McSwain, 1951)
GERMINATIVE ENERGY: 98% in 4 days (Steinbauer & Grigsby, 1957)
GERMINATIVE CAPACITY: 95% (Stefferud, 1948)

BROMUS TECTORUM L.
Downy Brome

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 208,000/lb (Stefferud, 1948)

PRETREATMENT

DURATION OF GOOD VIABILITY: Less than 1 year in soil (Chepil, 1946)
STRATIFICATION: Prechill at 5°C for 5-7 days (Steinbauer & Grigsby, 1957)

LABORATORY GERMINATION

TEMPERATURE: Constant: Optimum 15-20°C at 0 bars matric potential, 10-20°C over wide range of matric potentials (Thill et al., 1979); 15°C for dormant seed, 20-25°C after primary dormancy has passed (Steinbauer & Grigsby, 1957); Fluctuating: Germination higher under very negative matric potentials if temperature fluctuating (Thill et al., 1979); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
MOISTURE: Germination 61% at 0 bars, 10% at 15.6 bars (Thill et al., 1979)
LIGHT: Light not required (Steinbauer & Grigsby, 1957); Light required (Haferkamp & McSwain, 1951)
GERMINATIVE ENERGY: 98% in 4 days (Steinbauer & Grigsby, 1957)
GERMINATIVE CAPACITY: 95% (Stefferud, 1948)
COMMENTS: Germination increased by moistening substratum with 0.1 m mole KNO_3 (Evans & Young, 1975)

CULTURAL PRACTICES

PLANTING DEPTH: 1" or less (Young et al., 1969); 1/2" (Hull, 1964)

BUCHLOE DACTYLOIDES (Nutt.) Engelm.
Buffalograss

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 3,120/oz, 110/g (AOSA, 1978); 93,000/kg (Heady, 1975); 42,000/lb (Vallentine, 1971; Atkins & Smith, 1967)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Late summer to late fall (Cooper et al., 1957); Spring crop mature around second or third week in Jun (Wheeler & Hill, 1957); Between Jul 15-Jul 20 (Wheeler, 1950)
METHOD OF COLLECTION: Flail-type forage harvester or other special machine (Atkins & Smith, 1967); Direct combining or windrowing (Harmond et al., 1961); Harvest with combine (Cooper et al., 1957; Wheeler & Hill, 1957); Small grain combines altered so that sickle can be run very close to the ground (Archer & Bunch, 1953; Hoover et al., 1948; Hoover et al., 1947); Combine, flailing machines, suction machines, wind-blast machine, or hand-harvesting burs with stable brooms (Wolff, 1951); Vacuum machine, windblast machine, or specially constructed combine (Wheeler, 1950)
METHOD OF CLEANING: Fanning mill (Wheeler & Hill, 1957; Wolff, 1951; Hoover et al., 1947)

PRETREATMENT

DURATION OF GOOD VIABILITY: 5 years (Kneebone, 1960)
STRATIFICATION: Prechill at 5°C for 6 weeks (AOSA, 1978; USDA, 1952; Wenger, 1941; Musil, 1941); Soak in 0.5% KNO_3 for 24 hours then chill at 40°F for 6 weeks (Wheeler, 1950)
SCARIFICATION: Clip the burs at the distal end with a sharp blade (Thornton, 1966a); Puncture the pericarp (Pladeck, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (AOSA, 1978; USDA, 1952); 29.5-18°C at 12-12 hours (Bokhari et al., 1975); 17-30°C (Norris & Decker, 1944); 20-30°C at 17-7 hours (Pladeck, 1940)
MOISTURE: Lower Limit: -3 bars (Bokhari et al., 1975)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE ENERGY: 16% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 65% (Atkins & Smith, 1967); 45% (Cooper et al., 1957); 67% (Wolff, 1951); 70% (Stefferud, 1948)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-3/4" (Allred & Nixon, 1955); 1/2" (Wheeler, 1950); 1/2-1" (Stefferud, 1948)
PLANTING TIME: Dec-Jun (Archer & Bunch, 1953); Mar-Apr (Stefferud, 1948)
EXPOSURE: Poor shade tolerance (Elder, 1954)
SOIL TEXTURE: Adapted to clay (Heady, 1975); Silty-good, clayey-good, sandy-poor (Vallentine, 1971); Silt or clay (Cooper et al., 1957); Clay to loam (Allred & Nixon, 1955); Clay-loam (Stefferud, 1948); Adapted to clayey soils but grows well on sandy loam soils which contain a fair percentage of clay (Savage, 1934)
SOIL MOISTURE: Adapted to wet (Heady, 1975); Low moisture requirement (Cooper et al., 1957); Dry to medium-moist (Sampson, 1924)
DRAINAGE: Well-drained (Savage, 1934)

CALAMAGROSTIS CANADENSIS (Michx.) Beauv.
Bluejoint

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 239,842/oz, 8,461/g (AOSA, 1978); 3,604,000-3,769,000/lb, mean 3,681,000/lb (Klebesadel et al., 1962)
SEED MATURITY: Aug (Sampson, 1924)
METHOD OF CLEANING: Ball hammermill, Model No. 1-Modern (Klebesadel et al., 1962)

PRETREATMENT

STRATIFICATION: Prechill at 5°C for 5 days (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978)
LIGHT: Light optional (AOSA, 1978)
GERMINATIVE CAPACITY: 60-70% in 21 days (Klebesadel et al., 1962)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Brown, 1979; Frolik & Keim, 1938); Moist (USDA, For. Ser., 1937; Sampson, 1924)

CALAMAGROSTIS INEXPANSA A. Gray
Northern Reedgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Frolik & Keim, 1938)

CALAMAGROSTIS PURPURESCENS R. Br.
Purple Reedgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Possibly inhibited by light (Amen, 1966)

CALAMAGROSTIS RUBESCENS Buckl.
Pinegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Not needed (McLean, 1967)
SCARIFICATION: Not needed (McLean, 1967)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 38% (McLean, 1967); 58-98% (Sampson, 1924)

CALAMOVILFA GIGANTEA (Nutt.) Scribn. & Merr.
Big Sandreed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 88,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 74% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL TEXTURE: Sand (Stefferud, 1948)

CALAMOVILFA LONGIFOLIA (Hook.) Scribn.
Prairie Sandreed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 274,000/lb (Vallentine, 1971); 273,700/lb (Stefferud, 1948)
METHOD OF COLLECTION: Combine (Flory & Marshall, 1942)
METHOD OF CLEANING: Hammermill then screen and fan (Weber, 1939)

PRETREATMENT

SCARIFICATION: Scarify with sand (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 75% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1" (Flory & Marshall, 1942)
SOIL TEXTURE: Sandy soils and also deep medium-textured soils (Ohlenbusch, 1976); Sandy-good, silty-fair, clayey-poor (Vallentine, 1971); Sand, sandy loam (Stefferud, 1948); Adapted to sandy soils but also grows well on heavy-textured soils (Frolik & Keim, 1938)

CAREX ALBO-NIGRA Mkze.
Black-and-White Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

SCARIFICATION: Cut basal end of achene (Amen & Bonde, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 8% (Johnson et al., 1965)

CAREX AQUATILIS Wahl.
Water Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native emergent grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Better germination in light (Bliss, 1958)
GERMINATIVE CAPACITY: 2.7% (Bliss, 1958)

CULTURAL PRACTICES

SOIL MOISTURE: Swamps, wet meadows, shallow water (Hermann, 1970)

CAREX ATHROSTACHYA Olney
Slenderbeak Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 7 days (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE ENERGY: 10% (Johnson et al., 1965)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Hermann, 1970)

CAREX ATRATA L.
Black Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

SCARIFICATION: Sand scarification (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 31% (Johnson et al., 1965)

CAREX BIGELOWII Torr.
Bigelow Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Hermann, 1970)

LABORATORY GERMINATION

LIGHT: Better germination in light (Bliss, 1958)
GERMINATIVE CAPACITY: 6.2% (Bliss, 1958)

CAREX CHALCIOLEPIS Holm

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Stratification promotive but unnecessary (Amen, 1966); Store moist seed at 34-38°F for 7 days (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 31% (Johnson et al., 1965)

CAREX EBENEA Rydb.
Ebony Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965); Fluorescent and red light (Amen & Bonde, 1964)
GERMINATIVE CAPACITY: 98% in 31 days (Johnson et al., 1965)

CAREX EGGLESTONII Mkze.
Eggleston Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill 3 days at 2-4°C (Wiesner et al., 1963); Store moist seed at 34-48°F for 30 days (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE ENERGY: 45% in 9 days (Wiesner et al., 1967)
GERMINATIVE CAPACITY: 77% in 26 days (Weisner et al., 1967); 93% (Johnson et al., 1967)

CULUTRAL PRACTICES

SOIL MOISTURE: Dry (Hermann, 1970)

CAREX EXSICCATA L. H. Bailey
Tall Swamp Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Saturated soils (Sampson, 1917)
ORGANIC MATTER: Rich organic soil (Sampson, 1917)

CAREX FESTIVELLA Mkze.
Ovalhead Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Prefers loamy but common on rocky (USDA, For. Ser., 1937)
SOIL DEPTH: Prefers deep but common on shallow (USDA, For. Ser., 1937)
SOIL MOISTURE: Moist (USDA, For. Ser., 1937)

CAREX FILIFOLIA Nutt.
Threadleaf Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy (ND Agric. Exp. Sta., 1941); Medium-textured soils (Reitz & Morris, 1939)
SOIL MOISTURE: Dry (ND Agric. Exp. Sta., 1941; USDA, For. Ser., 1937)

CAREX GEYERI Boott
Elk Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy, gravelly, or rocky (USDA, For. Ser., 1937)
DRAINAGE: Well drained (USDA, For. Ser., 1937)

CAREX HOODII Boott
Hood Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill at 2°C for 16 weeks (McDonough, 1969); Prechill 3 days at 2-4°C (Wiesner et al., 1967)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE ENERGY: 37% in 28 days (Weisner et al., 1967)
GERMINATIVE CAPACITY: 39% in 77 days (Weisner et al., 1967); 21% (Johnson et al., 1965)

CAREX ILLOTA L. H. Bailey
Sheep Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 71% (Johnson et al., 1965)

CULUTRAL PRACTICES

SOIL MOISTURE: Moist (Sampson, 1917)

CAREX KELLOGGII W. Boott
Kellogg Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 7 days (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 7% (Johnson et al., 1965)

CULTURAL PRACTICES

SOIL MOISTURE: Lake margins, wet banks, moist to marshy meadows (Hermann, 1970)

CAREX LIMNOPHILA F. J. Herm.

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Hermann, 1970)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 24 hours (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 100% (Johnson et al., 1965)

CAREX MEDIA R. Br.

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 24 hours (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 5% (Johnson et al., 1965)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Hermann, 1970)

CAREX MICROPTERA Mack.
Smallwing Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Hermann, 1970)

PRETREATMENT

STRATIFICATION: Prechill 3 days at 2-4°C (Wiesner et al., 1967)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 26% in 27 days (Weisner et al., 1967); 83% (Johnson et al., 1965)

CAREX NEBRASKENSIS Dewey
Nebraska Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 7 days (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 36% (Johnson et al., 1965)

CULTURAL PRACTICES

SOIL TEXTURE: Loamy or marshy (USDA, For. Ser., 1937)
SOIL MOISTURE: Wet (USDA, For. Ser., 1937)

CAREX NELSONII Mkze.

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 69% (Johnson et al., 1965)

CAREX NOVA L. H. Bailey

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 30% (Johnson et al., 1965)

CAREX PACHYSTACHYA Cham.
Chamisso Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

GERMINATIVE ENERGY: 1% in 28 days (Wiesner et al., 1967)
GERMINATIVE CAPACITY: 22% in 77 days Weisner et al., 1967)

CAREX PETASTA Dewey
Liddon Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 24 Hours (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 21% (Johnson et al., 1965)

CULTURAL PRACTICES

SOIL TEXTURE: Rocky (Hermann, 1970)

CAREX PHAEOCEPHALA Piper
Dunhead Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill 3 days at 2-4°C (Wiesner et al., 1967); Store moist seed at 34-38°F for 24 hours (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE ENERGY: 8% in 28 days (Wiesner et al., 1967)
GERMINATIVE CAPACITY: 35% in 77 days (Wiesner et al., 1967); 86% (Johnson et al., 1965)

CAREX PHYSOCARPA Presl

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store moist seed at 34-38°F for 7 days (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 1% (Johnson et al., 1965)

CAREX RAYNOLDSII Dewey
Raynolds Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

SCARIFICATION: Cut seed coat with razor blade (Johnson et al., 1965)

LABORATORY GERMINATION

LIGHT: Light required (Johnson et al., 1965)
GERMINATIVE CAPACITY: 3% (Johnson et al., 1965)

CAREX SCOPULORUM Holm
Cliff Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Amen, 1966; Johnson et al., 1965)
GERMINATIVE CAPACITY: 2% (Johnson et al., 1965)

CAREX STIPATA Muhl.
Prickly Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULUTRAL PRACTICES

SOIL MOISTURE: Wet (Brown, 1979)

CAREX VULPINOIDEA Michx.
Fox Sedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 1,297,142/lb (Swingle, 1939)

CULUTRAL PRACTICES

SOIL MOISTURE: Wet (Brown, 1979)

CAREX XERANTICA Bailey

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 17-22°C at 16-8 hours (McDonough, 1970)
GERMINATIVE CAPACITY: 97% in 28 days (McDonough, 1970)

CENCHRUS LONGISPINUS (Hack.) Fern.
Longspine Sandbur

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Hitchcock, 1971)

LABORATORY GERMINATION

TEMPERATURE: Constant: 25°C (Twentyman, 1974); Fluctuating: 10-20°C, 15-25°C, 20-30°C at 12-12 hours (Twentyman, 1974)
LIGHT: Better germination in dark (Twentyman, 1974)

CENCHRUS PAUCIFLORUS Benth.
Field Sandbur

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 67,200/lb (Stevens, 1932)

CINNA LATIFOLIA (Trevir.) Griseb.
Slender Reedgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

EXPOSURE: Shaded situations (Sampson & Chase, 1927; Sampson, 1917)
SOIL MOISTURE: Moist (Sampson & Chase, 1927; Sampson, 1917)

CYNODON DACTYLON (L.) Pers.
Bermudagrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 99,140/oz, 3,495/g (AOSA, 1970); 3,480,000/kg (Heady, 1975); 1,787,000/lb (Vallentine, 1971)
SEED MATURITY: First crop during first half of Jul, second crop after first killing frost (Wheeler & Hill, 1957)
METHOD OF COLLECTION: Direct combining or windrowing (Harmond et al., 1961); Combine with sickle lowered to within 3-4" of the ground, short stemmed varieties can be harvested with a power lawnmower equipped

with a pan (Wheeler & Hill, 1957); Mower with a windrow attachment (Wheeler, 1950)
METHOD OF CLEANING: Clean with fanning mill (Wheeler & Hill, 1957); Fanning or gravity mill (Wheeler, 1950)

PRETREATMENT

SCARIFICATION: Treat unhulled seeds with concentrated HCl for 5 minutes (Burton, 1939); Treat longer than 3 minutes with H_2SO_4 (Morinaga, 1926); Treat 10 minutes with sulfuric acid (Bryan, 1918)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (AOSA, 1978; USDA, 1952); Maximum 40°C, minimum 8-12°C (Weinbrenn, 1946); 10-38°C at 18-6 hours (Morinaga, 1926)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 82-88% (Wheeler & Hill, 1957)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING TIME: Spring (Hoover et al., 1948)
EXPOSURE: Shade tolerance poor (Schmidt & Blaser, 1969; Burton & Deal, 1962)
SOIL TEXTURE: Adapted to loamy, clay (Heady, 1975); Sandy-good, Silty-good, clayey-fair (Vallentine, 1971); Heavy clay and silt soils (Wheeler & Hill, 1957); Sandy loams (Stefferud, 1948); Biggest yields on clay loam (Sampson, 1924); Prefers clayey soils but grows abundantly on sandy soils (Piper, 1922)
SOIL pH: Adapted to alkali (Heady, 1975); 5.5-7.5 (Beard, 1973)
SOIL MOISTURE: Adapted to wet (Heady, 1975)
DRAINAGE: Well drained (Wheeler & Hill, 1957)

CYNOSURUS CRISTATUS L.
Crested Dogtail

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 53,865/oz, 1,900/g (AOSA, 1978); 722,000/lb (Stefferud, 1948)

PRETREATMENT

STRATIFICATION: Prechill for 3 days at 5 or 10°C (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978)
LIGHT: Light required (AOSA, 1978)
GERMINATIVE CAPACITY: 80% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL MOISTURE: Fairly moist (Clark & Malte, 1913)

CYPERUS ACUMINATUS Torr. & Hook.
Taperleaf Flatsedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1976)

CYPERUS ARISTATUS Rottb.
Bearded Flatsedge

FAMILY: Cyperaceae
LIFE FORM: Annual native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store seed on moist filter paper at 5°C for 18 weeks (Baskin & Baskin, 1971); Stratification not very effective in overcoming dormancy (Baskin & Baskin, 1969)
SCARIFICATION: Immerse seeds in concentrated H_2SO_4 for 3 or 5 minutes, or clip the embryo end of the achene (Baskin & Baskin, 1971)

LABORATORY GERMINATION

LIGHT: Light required (Baskin & Baskin, 1976, 1971)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Mohlenbrock, 1976)

CYPERUS ERYTHRORHIZOS Muhl.
Redroot Flatsedge

FAMILY: Cyperaceae
LIFE FORM: Annual native grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

DURATION OF GOOD VIABILITY: 1 year (Justice, 1957)
STRATIFICATION: Prechill at 10°C (Justice, 1957)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Mohlenbrock, 1976)

CYPERUS ESCULENTUS L.
Northern Nutgrass

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 4,540,000/lb (Swingle, 1939)

PRETREATMENT

METHOD OF STORAGE: Store in warm room for 8 months (Bell & Larssen, 1960)

LABORATORY GERMINATION

TEMPERATURE: Minimum 21°C, optimum day/night 38/32°C (Thullen & Keeley, 1979); Optimum: 95°F (Bell & Larssen, 1960)
LIGHT: Germination better with 11 hours light than in continuous darkness (Thullen & Keeley, 1979); Germinates nearly as well in continuous darkness as in alternating light and dark (Bell & Larssen, 1960)
GERMINATIVE ENERGY: 46% (Hill et al., 1963)
GERMINATIVE CAPACITY: 89% in 365 days (Justice, 1946)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4" (Bell & Larssen, 1960)
SOIL TEXTURE: Sandy (Brown, 1979)
SOIL MOISTURE: Damp (Brown, 1979); Moist (Mohlenbrock, 1976)

CYPERUS FILICULMIS Vahl

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy (Brown, 1979); Rocky or sandy (Mohlenbrock, 1976)
SOIL MOISTURE: Dry (Harrington, 1964)

CYPERUS RIVULARIS Kunth
Brook Flatsedge

FAMILY: Cyperaceae
LIFE FORM: Annual native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Damp (Brown, 1979); Wet (Mohlenbrock, 1976)

CYPERUS SCHWEINITZII Torr.
Schweinitz Flatsedge

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 324,000/lb (Stevens, 1932)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy (Mohlenbrock, 1976)
SOIL MOISTURE: Rather dry (Harrington, 1964)

CYPERUS STRIGOSUS L.
Strawcolored Flatsedge

FAMILY: Cyperaceae
LIFE FORM: Perennial introduced grasslike
FRUIT: Achene (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Light required (Justice, 1957)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Brown, 1979); Wet (Mohlenbrock, 1976)

DACTYLIS GLOMERATA L.
Orchardgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 23,615-29,825/oz, 840-1,050/g (AOSA, 1978); 1,190,000/kg (Heady, 1975); 540,000/lb (Vallentine, 1971); 650,000/lb (Wheeler & Hill, 1957); 654,000/lb (Stefferud, 1948)
SEED MATURITY: Jun 15-20 (Wheeler, 1950)
METHOD OF COLLECTION: Harvest with a binder or by direct combining (Harmond et al., 1961; Archer & Bunch, 1953; Wheeler, 1950); Harvest with a binder best (Wheeler & Hill, 1957, Card, 1923)
METHOD OF CLEANING: Fanning mill (Wolff, 1951)

PRETREATMENT

METHOD OF STORAGE: Store at 5°C with 40% relative humidity (Canode, 1965)
DURATION OF GOOD VIABILITY: At least 14 years (Rincker & Maguire, 1979); 12-14 years (Hafenrichter et al., 1968)
STRATIFICATION: Prechill at 5 or 10°C for 7 days (AOSA, 1978; Canode et al., 1963);

Prechill at 5°C for 5 days (Maguire & Canode, 1963); Chill moist seed at temperatures between 5 and 10°C for 14 days (Sprague, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978, Canode et al., 1963; Maguire & Canode, 1963); 20-30°C at 16-8 hours (USDA, 1952); 10-30°C, 15-30°C at 16-8 hours (Sprague, 1940)
LIGHT: Light required (AOSA, 1970; USDA, 1952)
GERMINATIVE ENERGY: 30% in 7 days (Wolff, 1951); 95% in 14 days (Sprague, 1940)
GERMINATIVE CAPACITY: 85% (Wheeler & Hill, 1957; Stefferud, 1948); 90% or better (Hull & Pearse, 1943a); 82% (Wolff, 1951); 97% in 28 days (Sprague, 1940)
COMMENTS: Germination more rapid on soil (ASOA, 1978; USDA, 1952)

CULTURAL PRACTICES

PLANTING DEPTH: No deeper than 1" (Rogler et al., 1961)
PLANTING TIME: Early spring best (Myers, 1962); Spring (Wheeler & Hill, 1957); Early fall (Frischknecht, 1951)
EXPOSURE: Highly shade tolerant (Plummer et al., 1968; Hull & Johnson, 1955; Plummer et al., 1955; Frolik & Frolik, 1941); Grows well in partial shade (Anderson, 1941); Adapted to shade (Piper, 1924)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-fair (Valentine, 1971); Medium-textured (Hafenrichter et al., 1968); Does well on clay and clay loam soils (Archer & Bunch, 1953; Stewart & Walker, 1939); Piper, 1924); Adapted to a wide variety of soils but does not do well on sandy soils (Anderson, 1941)
SOIL pH: Calcareous, neutral, or medium acid (Hafenrichter et al., 1968); Does not do well on very alkaline soil (Myers, 1962); Does not do well on acid or alkali soils (Wheeler & Hill, 1957)
SOIL MOISTURE: Adapted to wet soils (Heady, 1975); Prefers moderate moisture and will grow in wet soils (Stewart & Walker, 1939)
PRECIPITATION: Mean annual precipitation at least 18" (Hafenrichter et al., 1968; Annual precipitation >12" (Plummer et al., 1968)
DRAINAGE: Well drained (Hafenrichter et al., 1968; Archer & Bunch, 1953); Does not do well on poorly drained soils (Wheeler & Hill, 1957)

DANTHONIA CALIFORNICA Boland
California Oatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

SCARIFICATION: Treat 15 minutes with concentrated H_2SO_4 (Laude, 1949)

CULTURAL PRACTICES

SOIL MOISTURE: Sometimes moist (Sampson & Chase, 1927)
DRAINAGE: Well drained (Sampson & Chase, 1927)

DANTHONIA INTERMEDIA Vasey
Timber Oatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

EXPOSURE: Grows mostly in the open but may grow in shade (Sampson et al., 1951)

DANTHONIA PARRYI Scribn.
Parry Oatgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

PLANTING DEPTH: Shallow (Johnston, 1961)

DANTHONIA SPICATA (L.) Beauv.
Povertygrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill at 3°C for 63 days (Toole, 1939)
SCARIFICATION: Pretreat with H_2SO_4 (Toole, 1939)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951); Room temperature to 35°C at 17-7 hours (Toole, 1939)

CULTURAL PRACTICES

SOIL MOISTURE: Dry (Brown, 1979)

DESCHAMPSIA CAESPITOSA (L.) Beauv.
Tufted Hairgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Sep (Sampson, 1924)
METHOD OF COLLECTION: Hand harvest (Sayers, 1963a)
METHOD OF CLEANING: Hand rubbing, sifting over 3 series of graduated screens, and a flowing air blast separator (Sayers, 1963a)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C (Sayers & Ward, 1966); Fluctuating: 10-25°C at 15-9 hours (Sayers & Ward, 1966; Sayers, 1963a, 1963b)
LIGHT: Higher germination in light (Sayers & Ward, 1966; Sayers, 1963a)
GERMINATIVE ENERGY: 50% in 7 days (Sayers & Ward, 1966)
GERMINATIVE CAPACITY: 88% in 28 days (Sayers & Ward, 1966)

CULTURAL PRACTICES

EXPOSURE: Open sites (Judd, 1962)
SOIL MOISTURE: Most (Judd, 1962; Sampson, 1917)

DIGITARIA SANGUINALIS (L.) Scop.
Crabgrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 825,000/lb (Stefferud, 1948); 788,870/lb (Stevens, 1932)

PRETREATMENT

STRATIFICATION: Prechill at 2-5°C for 2 weeks (Toole & Toole, 1941)
SCARIFICATION: Soak in water 24 hours, after-ripening required (Biswas et al., 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 18-6 hours (Toole & Toole, 1941)
LIGHT: Germination of prechilled seeds (wet or dry) is inhibited by light, seeds at room temperature or moderately heated are indifferent to light, at higher temperatures germination is light obligate (Siegel, 1950)

DIGITARIA ISCHAEMUM (Schreb.) Schreb.
Smooth Crabgrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill at 2-5°C for 8 weeks (Toole & Toole, 1941)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-40°C at 18-6 hours (Toole & Toole, 1941)
LIGHT: Light not required (Toole & Toole, 1941)
COMMENTS: Moistening substratum with 0.2% KNO_3 hastens germination at 15-25°C and 20-30°C alterations and retards it at 20-35°C and 20-40°C alterations (Toole & Toole, 1941)

DISTICHLIS STRICTA (Torr.) Rydb.
Inland Saltgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Between middle of Jul and first week in Sep (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 40-36°C at 8-16 hours (Sabo et al., 1979)
MOISTURE: Lower Limit: -13 bars (Sabo et al., 1979)

CULTURAL PRACTICES

SOIL pH: Alkaline (Stefferud, 1948; Frolik & Kiem, 1938; Sampson, 1924)
SOIL MOISTURE: Wet (Stefferud, 1948)
DRAINAGE: Poorly drained (ND Agric. Exp. Sta., 1941)

ECHINOCHLA CRUSGALLI (L.) Beauv.
Barnyardgrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 324,000/lb (Stevens, 1932)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Dawson, & Bruns, 1962)

ELEOCHARIS ACICULARIS (L.) R. & S.
Needle Spikerush

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Damp (Brown, 1979); Wet (Mohlenbrock, 1976)

ELEOCHARIS ENGELMANNI Steud.
Engelman Spikerush

FAMILY: Cyperaceae
LIFE FORM: Annual native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 2,160,000/lb (Stevens, 1932)

CULTURAL PRACTICES

SOIL MOISTURE: Moist or wet (Harrington, 1964)

ELEOCHARIS MACROSTACHYA Britton
Common Spikerush

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 908,000 (Swingle, 1939)
SEED MATURITY: Aug (Swingle, 1939)

CULTURAL PRACTICES

SOIL MOISTURE: Moist or wet (Harrington, 1964)

ELEOCHARIS OBTUSA (Willd.) Schult.
Blunt Spikerush

FAMILY: Cyperaceae
LIFE FORM: Annual native emergent grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1976)

ELEOCHARIS PAUCIFLORA (Lightf.) Link
Fewflowered Spikerush

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1976)

ELEUSINE INDICA (L.) Gaertn.
Goosegrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Achene (Booth, 1964; Arber, 1934); Caryopsis (Harrington, 1964); Utricle (Lawrence, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: Between 20-30°C and 20-35°C at 16-8 hours (Fulwider & Engel, 1959); 20-35°C, 25-40°C (Toole & Toole, 1940)
LIGHT: Importance of light compensated by ideal temperatures (Fulwider & Engle, 1959); Light required if 0.2% KNO_3 is not used to moisten substratum (Toole & Toole, 1940)
GERMINATIVE ENERGY: 78.5% in 5 days (Fulwider & Engel, 1959)
GERMINATIVE CAPACITY: 92.5% in 14 days (Fulwider & Engel, 1959)

ELYMUS AMBIGUUS var. *STRIGOSUS* (Rydb.) Hitchc.
Hairyscale Colorado Wildrye

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

ELYMUS CANADENSIS L.
Canada Wildrye

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 5,385/oz, 190/g (AOSA, 1978); 106,000/lb (Vallentine, 1971; Atkins &

Smith, 1967); 100,000/lb (Cooper et al., 1957); 115,000/lb (Wheeler & Hill, 1957; Stefferud, 1948); 110,000-120,000/lb (Hoover et al., 1947)

SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Early fall (Cooper et al., 1957); Jul in the South to Aug in the North (Wheeler & Hill, 1957); Late summer (Archer & Bunch, 1953; Wheeler, 1950; Hoover et al., 1948; Hoover et al., 1947); Early Aug (Sampson, 1924)

METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967); Harvest with binder or by direct combining (Harmond et al., 1961); Combine or binder (Cooper et al., 1957); Harvested most satisfactorily with binder (Wheeler & Hill, 1957; Hoover et al., 1948; Wheeler, 1950; Hoover et al., 1947); Harvested most satisfactorily with combine (Archer & Bunch, 1953); Combine or hand harvest with a half-sickle (Wolff, 1951)

METHOD OF CLEANING: Process in a hammermill (Wheeler & Hill, 1957; Wolff, 1951; Smith, 1946); Fanning mill (Hoover et al., 1947); Mill threshed seed in hammermill and clean with a seed cleaner (Schwendiman et al., 1940); Hammermill then screen and fan (Weber, 1939)

PRETREATMENT

DURATION OF GOOD VIABILITY: Seldom exceeds 2 years (Wolff, 1951); 5 years (McWilliams, 1950); 3 years (Blake, 1935)

STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-30°C at 16-8 hours (AOSA, 1978); 17-30°C (Norris & Decker, 1944)

LIGHT: Light required (AOSA, 1978)

GERMINATIVE ENERGY: 42% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 70% (Atkins & Smith, 1967); 77% (Cooper et al., 1957); 90% (Hoover et al., 1947; Archer & Bunch, 1953; Wheeler, 1950); 70% (Wheeler & Hill, 1957); 79% (Wolff, 1951); 85% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1" (Allred & Nixon, 1955); 1" (McWilliams, 1955; Stefferud, 1948); If the surface of the soil is dry--up to 1" or slightly more in depth (Wheeler, 1950)

PLANTING TIME: Sep 5 (McWilliams, 1955); Early fall best, also can be done in late fall or spring (Wheeler, 1950)

SOIL TEXTURE: Sandy-good, silty-good, clayey-good (Vallentine, 1971); Sand, silt or clay (Atkins & Smith, 1967); Especially well adapted to sandy soils (Wheeler & Hill, 1957; Wheeler, 1950); Loam to sand (Allred & Nixon, 1955); Sand, sandy loam (Stefferud, 1948)

SOIL MOISTURE: Dry or moist (Brown, 1979); High moisture requirement (Cooper et al., 1957); Moist (Hull & Pearse, 1943b); Abundant moisture (Frolik & Keim, 1938); 2/3 saturation (Blake, 1935)

PRECIPITATION: 15-16" annual (MT Agric. Exp. Sta., 1970)

COMMENTS: Greenhouse: Most seedlings are produced when seeds are planted second year after harvest (Robocker et al., 1953)

ELYMUS CINEREUS Scribn. & Merr.
Great Basin Wildrye

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 95,000/lb (Vallentine, 1971) 130,760/lb (Plummer et al., 1968); 166,000/lb (Stefferud, 1948)

SEED MATURITY: Oct 1-Nov 5 (Plummer et al., 1968); Early Jul at lower elevations, Jul 15-Sep 1 at higher elevations (Sampson, 1924)

METHOD OF COLLECTION: Hand collect heads or combine (Plummer et al., 1968); Harvest with a combine (Donahue et al., 1956; Archer & Bunch, 1953; Hoover et al., 1948)

METHOD OF CLEANING: Dry, chop and fan (Plummer et al., 1968)

PRETREATMENT

STRATIFICATION: Prechill at 2°C for 16 weeks in 10^{-3} M GA_3 (McDonough, 1969)

LABORATORY GERMINATION

MOISTURE: Lower Limit: 4.5 atm (Choudhuri, 1968)

GERMINATIVE CAPACITY: 83% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1" (Archer & Bunch, 1953; Hoover et al., 1948; Flory & Marshall, 1942)

PLANTING TIME: Spring on areas flooded by spring runoff (Hafenrichter et al., 1968): Fall (Plummer et al., 1955)

SOIL TEXTURE: Silty-good, Clayey-good, sandy-poor (Vallentine, 1971)

SOIL pH: Adapted to alkali soils (Hafenrichter et al., 1968; Wheeler & Hill, 1957)

SOIL MOISTURE: Adapted to moist or wet soils (Wheeler & Hill, 1957; USDA, For. Ser., 1937); Moderately dry to moist or wet (Donohue et al., 1956)

ELYMUS GLAUCUS Buckl.
Blue Wildrye

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 131,000/lb (Hafenrichter et al., 1968); 135,000/lb (Wheeler & Hill, 1957); 137,000/lb (Stefferud, 1948)
METHOD OF CLEANING: Mill threshed seed in hammermill and clean with a seed cleaner (Schwendiman et al., 1940)

PRETREATMENT

DURATION OF GOOD VIABILITY: 2-4 years (Hafenrichter et al., 1968); 22 months (McAlister, 1943)
STRATIFICATION: Not needed (McLean, 1967)
SCARIFICATION: Not needed (McLean, 1967)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 85% (Hafenrichter et al., 1968; Stefferud, 1948); 100% (McLean, 1967); 80% (Wheeler & Hill, 1957); 81% (Archer & Bunch, 1953; Wheeler, 1950); 85% or above (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Plummer, 1943)
EXPOSURE: Shade tolerant (Plummer et al., 1955; Wheeler, 1950)
SOIL MOISTURE: Moderately moist (USDA, For. Ser., 1937)

ELYMUS JUNCEUS Fisch.
Russian Wildrye

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 9,810-10,515/oz, 345-370/g (AOSA, 1978); 375,000/kg (Heady, 1975); 175,000/lb (Vallentine, 1971; Atkins & Smith, 1967; Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Early summer (Cooper et al., 1957)
METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967; Cooper et al., 1957); Harvest with a binder (Wheeler & Hill, 1957; Wheeler, 1950; Hoover et al., 1947); Binder recommended but combine can also be used (Archer & Bunch, 1953); Binding or combining with combine cylinder run at low speeds (Conard, 1946)
METHOD OF CLEANING: Air column (Hassanyar & Wilson, 1978); Hammermill (Wheeler & Hill, 1957; Archer & Bunch, 1953; Hoover et al., 1947)

PRETREATMENT

DURATION OF GOOD VIABILITY: 5 years (McWilliams, 1950)
STRATIFICATION REQUIREMENTS: Prechill at 5 or 10°C for 5 days (AOSA, 1978); Prechill at 6°C for 4 days (Potter, 1951)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (McGinnies, 1960a); 25°C (Potter, 1951); Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; Potter, 1951)
MOISTURE: Optimum: Up to 7 1/2 atm (McGinnies, 1960a)
LIGHT: Light required (AOSA, 1978)
GERMINATIVE CAPACITY: 90% (Atkins & Smith, 1967; Wheeler & Hill, 1957); 83% (Cooper et al., 1957); 85% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1.8 cm (Ludwig, 1976); 1.3-2.5 cm (McGinnies, 1974, 1960b); 1/2" (McWilliam, 1955; Wheeler, 1950; McKenzie et al., 1946)
PLANTING TIME: Early spring (Ludwig, 1976); Last week in Aug or first week in Sep (Bement et al., 1965); As early in the spring as possible (Schaaf, 1961); Mid Apr to early May in northeastern CO (McGinnies, 1960b); Sep 20 (McWilliams, 1955); Early fall (Frischnecht, 1951; Wheeler, 1950)
EXPOSURE: Not well adapted to dense shade (Plummer et al., 1968); Does best on sunny sites (Plummer et al., 1955)
SOIL TEXTURE: Adapted to loamy, clay (Heady, 1975); Silty-good, clayey-good, sandy-poor (Vallentine, 1971); Produces best on clay loams (Archer & Bunch, 1953; Wheeler, 1950); Silt or clay (Atkins & Smith, 1967)
SOIL pH: Basic (Plummer et al., 1955)
SOIL MOISTURE: Low moisture requirement (Cooper et al., 1957); Grows well on both moist and dry sites (Hull & Johnson, 1955)
PRECIPITATION: 10-14" annual (Lang et al., 1975); 11-16" annual (Jefferies & Cardwell, 1964)

ELYMUS TRITICOIDES Buckl.
Creeping Wildrye

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 50,000/lb (Wheeler & Hill, 1957); 51,000/lb (Stefferud, 1948)
SEED MATURITY: Jul 15-Sep 15 (Sampson, 1924)

BEST DOCUMENT AVAILABLE

STRATIFICATION: Prechill at 1.5°C for 5 days (Wagner & Chapman, 1970)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-20°C (Wagner & Chapman, 1970); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 90% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL pH: Grows well in alkaline soils (Wheeler & Hill, 1957)
SOIL MOISTURE: Grows well in wet soils (Wheeler & Hill, 1957); Moderately moist (Sampson, 1924)
DRAINAGE: Grows well in poorly drained soils (Wheeler & Hill, 1957)

ELYMUS VIRGINICUS L.
Virginia Wildrye

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 73,000 (Wheeler & Hill, 1957; Stefferud, 1948)
METHOD OF COLLECTION: Combine or hand harvest with a half-sickle (Wolff, 1951)
METHOD OF CLEANING: Process in a hammermill (Wolff, 1951)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Wheeler & Hill, 1957; Wolff, 1951)

LABORATORY GERMINATION

GERMINATIVE ENERGY: 66% in 7 days (Wheeler & Hill, 1957; Wolff, 1951)
GERMINATIVE CAPACITY: 84% (Wheeler & Hill, 1957; Wolff, 1951; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1" (Archer & Bunch, 1953)
PLANTING TIME: Early fall best although stands may be obtained from early spring seeding (Archer & Bunch, 1953)
COMMENTS: Greenhouse: Most seedlings are produced when seeds are planted the second year after harvest (Robocker et al., 1953)

ERAGROSTIS CILIANENSIS (All.) Lutati
Stinkgrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 2,000,000/lb (Phillips Petroleum Co., 1974), 6,048,000/lb (Stevens, 1932)

ERAGROSTIS OXYLEPIS (Torr.) Torr.
Red Lovegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill 2 weeks at 5°C (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

ERAGROSTIS PILOSA (L.) Beauv.
India Lovegrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 10,080,000/lb (Stevens, 1932)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

ERAGROSTIS SPECTABILIS (Pursh) Steud.
Purple Lovegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill at 3-5°C for 10 weeks (Baskin & Baskin, 1969)

ERAGROSTIS TRICHODES (Nutt.) Wood
Sand Lovegrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 101,605/oz, 3,585/g (AOSA, 1978); 3,418,000/kg (Heady, 1975); 1,500,000/lb (Vallentine, 1971) 1,300,000/lb (Atkins & Smith, 1967; Cooper et al., 1957); 1,300,000/lb (Wheeler & Hill, 1952; Stefferud, 1948; Hoover et al., 1947)

SEED MATURITY: Sep 1-Oct 30 (Atkins & Smith, 1967); Late fall (Cooper et al., 1957); Fall (Wheeler, 1950); Late Sep (Hoover et al., 1947)

METHOD OF COLLECTION: Combine (Atkins & Smith, 1967; Cooper et al., 1957; Archer & Bunch, 1953); Direct combining (Harmond et al., 1961); Harvest with a combine, stripper, binder or by hand (Wheeler & Hill, 1957; Wolff, 1951); Binder or combine (Wheeler, 1950; Hoover et al., 1948; Hoover et al., 1947)

METHOD OF CLEANING: Use graduated screens and an air blast blower (Sayers, 1968); Fanning mill (Wheeler & Hill, 1957; Wolff, 1951; Hoover et al., 1948; Hoover et al., 1947)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Wheeler & Hill, 1957; Wolff, 1951)

STRATIFICATION: Prechill at 5 or 10°C for 6 weeks (AOSA, 1978); Prechill at 5 or 10°C for 4 weeks (Sayers, 1968); Prechill 2 weeks at 3-5°C (Toole, 1938)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978); 5-30°C, 10-30°C, 15-30°C at 9-15 hours (Sayers, 1968); 20-35°C at 18-6 hours (Toole, 1938)

LIGHT: Light required (AOSA, 1978); Maximum germination obtained with light and a pretreatment (Sayers, 1968)

GERMINATIVE ENERGY: 75% in 7 days (Wheeler & Hill, 1957); 76% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 80% (Atkins & Smith, 1967; Wheeler & Hill, 1957; Wolff, 1951); 75% (Cooper et al., 1957; Archer & Bunch, 1953; Wheeler, 1950; Hoover et al., 1947)

COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4-1/2" (Allred & Nixon, 1955); 1/2" (Stefferud, 1948)

PLANTING TIME: Mar-Apr (Stefferud, 1948)

SOIL TEXTURE: Adapted to sandy (Heady, 1975; Harlan, 1962; Hoover et al., 1948; Stefferud, 1948); Sandy-good, silty-fair, clayey-poor (Vallentine, 1971); Sand (Atkins & Smith, 1967); Sand to sandy loam (Allred & Nixon, 1955)

SOIL MOISTURE: Low moisture requirement (Cooper et al., 1957); Dry (Frolik & Keim, 1938)

COMMENTS: Greenhouse: Most seedlings are produced when seeds are planted the third year after harvest (Robocker et al., 1953)

ERIONEURON PULCHELLUM (H. B. K.) Tateoka
Fluffgrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Constant: Room temperature (Haferkamp & McSwain, 1951)

FESTUCA ARIZONICA Vasey
Arizona Fescue

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Sep 10-Sep 22 (Pearson, 1967); Jun 15-Aug 1 at lower elevations, by Sep 10 at higher elevations (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

EXPOSURE: Somewhat shade tolerant (Sampson, 1924)

SOIL TEXTURE: Clay loams, also sandy, gravelly or rocky soils (USDA, For. Ser., 1937)

SOIL DEPTH: Shallow (USDA, For. Ser., 1937)

SOIL MOISTURE: Dry (USDA, For. Ser., 1937)

FESTUCA ARUNDINACEA Schreb.
Tall Fescue

FAMILY: Gramineae

LIFE FORM: Perennial introduced grass

FRUIT: Caryopsis (Hitchcock, 1971)

PROCUREMENT

SEEDS/UNIT WT: 11,115-14,600/oz, 390-515/g (AOSA, 1978); 534,000/kg (Heady, 1975); 227,000/lb (Vallentine, 1971; Atkins & Smith, 1967); 230,000/lb (Cooper et al., 1957; Wheeler & Hill, 1957)
SEED MATURITY: Jul 16-Aug 30 (Atkins & Smith, 1967); Late summer (Cooper et al., 1957)
METHOD OF COLLECTION: Combine preferred, also windrower (Atkins & Smith, 1967); Binder, direct combining or windrowing (Cowan, 1962; Harmond et al., 1961); Combine preferred, also binder (Cooper et al., 1957); Harvest with binder before seed reaches full maturity (Wheeler & Hill, 1957); Combine or cut with a binder (Archer & Bunch, 1953); Harvest with a grain binder or combine from windrow (Wheeler, 1950)

PRETREATMENT

DURATION OF GOOD VIABILITY: 8-10 years (Hafenrichter et al., 1968)
STRATIFICATION: Prechill at 5 or 10°C for 5 days (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20-25°C for nondormant seed (Boyce et al., 1976); 12-28°C (Danielson & Toole, 1976); Fluctuating: 15-25°C, 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 20-25°C at 8 hours and 10-15°C at 16 hours (Boyce et al., 1976); 20-30°C, 18-28PC, 15-30°C at 16-8 hours (Stanway, 1952)
LIGHT: Light optional (AOSA, 1978); Red light increases germination (Danielson & Toole, 1976); Light required (USDA, 1952)
GERMINATIVE CAPACITY: 90% (Atkins & Smith, 1967; Wheeler & Hill, 1957); 83% (Cooper et al., 1957)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: No deeper than 1" (Rogler et al., 1961); 1/2-1" (Archer & Bunch, 1953); Not more than 1/2" (Wheeler, 1950)
PLANTING TIME: Aug 15-Nov 1 or Mar 1-Apr 15 (Archer & Bunch, 1953); Early fall (Frischknecht, 1951); Fall or spring (Wheeler, 1950)
SOIL TEXTURE: Adapted to loamy, clay (Heady, 1975); Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967)
SOIL pH: 5.5-6.5 preferred with pH from 4.7-8.5 tolerated (Beard, 1973); Adapted to alkali (Heady, 1975); Tolerant to highly acid and highly alkaline soils (Cowan, 1962; Wheeler & Hill, 1957)
SOIL DEPTH: Deep (Keim & Newell, 1955)
SOIL MOISTURE: Adapted to wet (Heady, 1975; Keim & Newell, 1955); High moisture requirement (Cooper et al., 1957)
PRECIPITATION: Not recommended where there is <18" annual rainfall (Wheeler & Hill, 1957)
ORGANIC MATTER: High in organic matter (Beard, 1973)
DRAINAGE: Does well on poorly drained (Archer & Bunch, 1953)

FESTUCA ELATIOR L.
Meadow Fescue

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 14,090/oz, 495/g (AOSA, 1978); 230,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
METHOD OF COLLECTION: Harvest with a binder then shock and thresh or combine (Wheeler, 1950)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C (Kearns & Toole, 1939); Fluctuating: 15-25°C, 20-30°C at 16-8 hours (AOSA, 1970; USDA, 1952); 15-25°C at 16-8 hours (Kearns & Toole, 1939)
LIGHT: Light optional (AOSA, 1970; USDA, 1952; Kearns & Toole, 1939)
GERMINATIVE CAPACITY: 90% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1" (Archer & Bunch, 1953)
PLANTING TIME: Fall or spring (Archer & Bunch, 1953)
EXPOSURE: Grows fairly well in shade (Frolik & Frolik, 1941); Does as well as orchardgrass in shade (Piper, 1924)
SOIL TEXTURE: Does not succeed well in sandy (Stewart & Walker, 1939)
SOIL pH: Slightly alkaline (Morris et al., 1950)
SOIL DEPTH: Deep (Archer & Bunch, 1953)
SOIL MOISTURE: Moist (Archer & Bunch, 1953; Anderson, 1941; Frolik & Frolik, 1941); Moist or wet (Stewart & Walker, 1939; Piper, 1924)

FESTUCA IDAHOENSIS Elmer
Idaho Fescue

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 450,000/lb (Vallentine, 1971; Hafenrichter et al., 1968)
SEED MATURITY: Aug (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 10-20°C, 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 80% (Hafenrichter et al., 1968)

CULTURAL PRACTICES

SOIL TEXTURE: Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Clay to rocky, sandy or gravelly loams best (USDA, For. Ser., 1937)
SOIL DEPTH: Shallow to deep, moderately deep best (USDA, For. Ser., 1937)
SOIL MOISTURE: Moist to dry, fairly dry best (USDA, For., Ser., 1937); Moderately dry (Sampson, 1924)
DRAINAGE: Well drained (USDA, For. Ser., 1937)

FESTUCA OCTOFLORA Walt.
Sixweeks Fescue

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 965,000/lb (Stefferud, 1948)

PRETREATMENT

STRATIFICATION: Prechilling at 3-5°C required for freshly harvested seed (Hylton & Bass, 1961)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Hylton & Bass, 1961; Hylton & Bement, 1961); Fluctuating: 15-25°C at 15-9 hours (Hylton & Bass, 1961; Hylton & Bement, 1961)
LIGHT: Light (100 ftc) promotes germination more than restricted light at 15-30°C, the reverse is true at 15-25°C and 20-30°C (Hylton & Bass, 1961)
COMMENTS: 0.2% KNO_3 increases germination (Hylton & Bass, 1961)

FESTUCA OVINA L.
Sheep Fescue

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 33,145/oz, 1,165/g (AOSA, 1978); 680,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: Forepart of Sep (Sampson, 1924)
METHOD OF COLLECTION: Harvest with a combine (Wheeler & Hill, 1957)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C, 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required at 20-30°C (AOSA, 1978); inhibited by light (Amen, 1966)
GERMINATIVE CAPACITY: 96% in 28 days (McDonough, 1970); 85% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4" (Plummer, 1943)
PLANTING TIME: Fall (Wheeler & Hill, 1957)
SOIL TEXTURE: Sandy, gravelly, or rocky soils preferred (USDA, For. Ser., 1937)
SOIL pH: Acidic preferred (Beard, 1973)
SOIL MOISTURE: Dry (Brown, 1979); Dry preferred (USDA, For. Ser., 1937; Sampson, 1924)

FESTUCA RUBRA L.
Red Fescue

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 22,820-28,040/oz, 805-990/g (AOSA, 1978); 615,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
METHOD OF COLLECTION: Harvest with a binder, combine or windrower (Wheeler & Hill, 1957)

PRETREATMENT

STRATIFICATION: Prechill at 5 or 10°C for 5 days (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978; Shenberger, 1961; USDA, 1952)
LIGHT: Light optional (AOSA, 1978; USDA, 1952); 5 or 50 ftc (Shenberger, 1961)
GERMINATIVE CAPACITY: 80% (Stefferud, 1948)
COMMENTS: 0.2% KNO_3 to moisten substratum optional (AOSA, 1978)

CULTURAL PRACTICES

EXPOSURE: Well adapted to shade (Sprague & Evaul, 1930)
SOIL TEXTURE: Sandy (Beard, 1973); Sandy or gravelly (Clark & Malte, 1913)
SOIL pH: 5.5-6.5 (Beard, 1973; Juska et al., 1965; Juska & Hanson, 1959)
SOIL MOISTURE: Dry (Beard, 1973)
DRAINAGE: Does not tolerate poorly drained soil (Beard, 1973)

FESTUCA SCABRELLA Torr.
Rough Fescue

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Constant: 65°F (Johnston, 1961)

CULTURAL PRACTICES

PLANTING DEPTH: Shallow (Johnston, 1961)
SOIL TEXTURE: Sandy (Morris et al., 1950); Sandy loam (USDA, For. Ser., 1937)
SOIL DEPTH: Deep (Morris et al., 1950; USDA, For. Ser., 1937)
SOIL MOISTURE: Dry (Morris et al., 1950; USDA, For. Ser., 1937)

FESTUCA THURBERI Vasey
Thurber Fescue

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy loam preferred (USDA, For. Ser., 1937)

FIMBRISTYLIS PUBERULA (Michx.) Vahl.

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Moist or dry (Mohlenbrock, 1976)

GLYCERIA ELATA (Lam.) Hitchc.
Tall Mannagrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Jul and Aug (Sampson et al., 1951)

CULTURAL PRACTICES

EXPOSURE: Tolerant of shade (Sampson et al., 1951)

GLYCERIA GRANDIS S. Wats.
American Mannagrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Brown, 1979)

GLYCERIA PAUCIFLORA Presl.
Weak Mannagrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

GLYCERIA STRIATA (Lam.) Hitchc.
Fowl Mannagrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Jul to the forepart of Sep (USDA, For. Ser., 1937); Between Aug and the forepart of Sep (Sampson, 1924)

PRETREATMENT

STRATIFICATION: Store in tap water at 1-3°C for 5-7 months (Muenscher, 1936)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 85% (Sampson, 1924)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (USDA, For. Ser., 1937; Sampson, 1924)

HILARIA JAMESII (Torr.) Benth.
Galleta

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 159,000/lb (Stefferud, 1948); About 180,000/lb (Flory & Marshall, 1942)
METHOD OF COLLECTION: Readily collected by machinery from native stands (Hoover, 1939)

LABORATORY GERMINATION

TEMPERATURE: Constant: 29°C (Sabo et al., 1979); 90°F (Knipe, 1967); Fluctuating: 75-95°F (Knipe, 1967); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
MOISTURE: Optimum: 0-7 atm (Knipe, 1968)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 82% (Bridges, 1941); 14% in 30 days (Wilson, 1931)

CULTURAL PRACTICES

SOIL TEXTURE: Clay loam (Stefferud, 1948); Grows best on heavy clay soils but will do well on lighter soils (Bridges, 1942)
SOIL pH: Attains major development on slightly alkaline or limy (Flory & Marshall, 1942)

HOLCUS LANATUS L.
Velvetgrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 95,060/oz, 3,360/g (AOSA, 1978); 1,524,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 85% (Stefferud, 1948)

CULTURAL PRACTICES

EXPOSURE: Does not endure shade (Piper, 1924)

HORDEUM BRANCHYANTHERUM Nevski
Meadow Barley

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill fresh seed (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 76% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Morris et al., 1950)
DRAINAGE: Poorly drained (Morris et al., 1950)

HORDEUM JUBATUM L.
Foxtail Barley

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 403,200/lb (Stevens, 1932)
SEED MATURITY: Jul 1 (ND Agric. Exp. Sta. 1941)

PRETREATMENT

STRATIFICATION: Storage at 35°F reduces germination (Cords, 1960)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 10-15°C at 10-14 hours (Ungar, 1974)
LIGHT: Light not required (Ungar, 1974)
GERMINATIVE CAPACITY: 98% in 20 days (Ungar, 1974)

JUNCUS ACUMINATUS Michx.
Tapertip Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Correll & Correll, 1975)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1970)

JUNCUS ALPINUS Vill.
Alpine Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1968)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1970)

JUNCUS ARTICULATUS L.

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Store in tap water at 1-3°C for 5-7 months (Muenscher, 1936)

LABORATORY GERMINATION

GERMINATIVE ENERGY: 96-97% in 2 or 3 days (Muenscher, 1936)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Harrington, 1964)

JUNCUS BALTICUS Willd.
Wire Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

CULTURAL PRACTICES

SOIL pH: Best growth on neutral or slightly acid soils (USDA, For. Ser., 1937)
SOIL DEPTH: Deep preferred (USDA, For. Ser., 1937)
SOIL MOISTURE: Moist or wet preferred (Mohlenbrock, 1970; USDA, For. Ser., 1937)
ORGANIC MATTER: Organic preferred (USDA, For. Ser., 1937)

JUNCUS BUFONIUS L.
Toad Rush

FAMILY: Juncaceae
LIFE FORM: Annual native grasslike
FRUIT: Capsule (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 30,240,000/lb (Stevens, 1932)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1970)

JUNCUS GERARDI Loisel.
Saltmeadow Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Braun, 1967)

CULTURAL PRACTICES

SOIL MOISTURE: Marshy (Mohlenbrock, 1970)

JUNCUS INTERIOR Wieg.
Inland Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1970); Dry or moist (Harrington, 1964)

JUNCUS MARGINATUS Rostk.
Shore Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Moist (Brown, 1979); Wet (Mohlenbrock, 1970)

JUNCUS NODOSUS L.
Jointed Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1970)

JUNCUS PARRYI Engelm.
Parry Rush

FAMILY: Junaceae
LIFEFORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

CULTURAL PRACTICES

DRAINAGE: Well drained (Sampson, 1917)

JUNCUS TENUIS Willd.
Path Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

LABORATORY GERMINATION

LIGHT: Germination favored by light (Mayer & Poljakoff-Mayber, 1975)

CULTURAL PRACTICES

SOIL MOISTURE: Moist or dry (Mohlenbrock, 1970)

JUNCUS TORREYI Cov.
Torrey Rush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 37,800,000/lb (Stevens, 1932)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Mohlenbrock, 1970)

KOELERIA CRISTATA (L.) Pers.
Junegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Aug 15 at lower elevations, 8,000-10,000' in early Sep (Sampson, 1924)
METHOD OF CLEANING: Board and paddle method for small lots (Hull, 1943)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Blake, 1935)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 43% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL TEXTURE: Loam (Stefferud, 1948); Best growth on sandy soils (ND Agric. Exp. Sta., 1941)
SOIL MOISTURE: Adapted to dry hills and plains (Frolik & Keim, 1938); 1/2 saturation (Blake, 1935)
DRAINAGE: Well drained (Sampson, 1924)

LOLIUM MULTIFLORUM Lam.
Italian Ryegrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 11,225-12,560/oz, 395-445/g (AOSA, 1978); 531,000/kg (Heady, 1975); 217,000/lb (Hafenrichter et al., 1968); 230,000/lb (Wheeler & Hill, 1957); 227,000/lb (Stefferud, 1948)
METHOD OF COLLECTION: Combine (Schoth & Weihing, 1962); Cut with binder and thresh bundles; mow, swath and thresh from the windrow; or combine direct (Archer & Bunch, 1953); Bind and thresh the bundles or combine from the windrow (Wolff, 1951); Cut with a binder or header (Wheeler, 1950); Cut with a header or binder when the seed is in the hard-dough stage (Hoover et al., 1948)

PRETREATMENT

DURATION OF GOOD VIABILITY: 2 years (Wolff, 1951)
STRATIFICATION: KNO_3 and prechill at 5 or 10°C for 5 days, if necessary rechill for 3 days (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C in simulated litter (Young et al., 1975); Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978; Colbry & Wiseman, 1961); 15-10°C, 5-15°C, 5-20°C, 5-25°C and 10-15°C at 16-8 hours (Young et al., 1975); 20-30°C at 16-8 hours (USDA, 1952); 10-30°C at 16-8 hours (Andersen, 1947b)
LIGHT: Light required (AOSA, 1978; Andersen, 1947b); Direct light of approximately 100 ftc (Colbry & Wiseman, 1961)
GERMINATIVE ENERGY: 87% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 90% (Hafenrichter et al., 1978; Stefferud, 1948); 92% (Wolff, 1951)
COMMENTS: Germination markedly lower at 15-25°C (Young et al., 1975)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Schoth & Weihing, 1962; Hoover et al., 1948)
PLANTING TIME: Spring where winters are severe, fall where winters are mild (Schoth & Weihing, 1962); Sep-Dec or in early spring (Archer & Bunch, 1953); Fall or early spring (Wheeler, 1950; Hoover et al., 1948)
SOIL TEXTURE: Adapted to loamy (Heady, 1975); Adapted to a wide range of soils but does best on clays and loams (Archer & Bunch, 1953); Medium to fine texture (Stewart & Walker, 1939); Prefers loam or sandy loam soils, but does fairly well on clay loams (Piper, 1924)
SOIL pH: 6.0-7.0 (Beard, 1973)
SOIL MOISTURE: Wet (Beard, 1973)
PRECIPITATION: Mean annual >18" (Hafenrichter et al., 1968)
DRAINAGE: Any soil except those that are excessively drained or very poorly drained (Hafenrichter et al., 1968); Does best on well-drained (Archer & Bunch, 1953)

LOLIUM PERENNE L.
Perennial Ryegrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 13,155-16,895/oz, 465-595/g (AOSA, 1978); 545,000/kg (Heady, 1975); 247,000/lb (Vallentine, 1971; Hafenrichter et al., 1968); 230,000/lb (Wheeler & Hill, 1957); 227,000/lb (Stefferud, 1948)
METHOD OF COLLECTION: Windrowing and combining (Hafenrichter et al., 1968); Combine (Schoth & Weihing, 1962); Bind and thresh the bundles or combine from the windrow (Wolff, 1951); Cut with a binder or header (Wheeler, 1950); Cut with a header or binder when the seed is in the hard-dough stage (Hoover et al., 1948)

PRETREATMENT

STRATIFICATION: KNO_3 and prechill at 5-10°C for 5 days, if necessary rechill for 3 days (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978); 20-30°C at 16-8 hours (USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 90% (Hafenrichter et al., 1968; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Schoth & Weihing, 1962; Hoover et al., 1948)
PLANTING TIME: Spring where winters are severe, fall where winters are mild (Schoth & Weihing, 1962); Fall or early spring (Wheeler, 1950; Hoover et al., 1948)
EXPOSURE: Adaptation to partial shading is good (Beard, 1973)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Medium-fine (Stewart & & Walker, 1939)
SOIL pH: Best growth occurs on neutral to slightly acidic soils (Beard, 1973)
SOIL MOISTURE: Adapted to wet (Heady, 1975); Moist (MT Agric. Exp. Sta., 1970; Piper, 1924)
DRAINAGE: Well drained (Piper, 1924)

LUZULA PARVIFLORA (Ehrh.) Desv.
Millet Woodrush

FAMILY: Juncaceae
LIFE FORM: Perennial introduced grasslike
FRUIT: Capsule (Harrington, 1964)

PRETREATMENT

SCARIFICATION: Remove micropylar tip of the embryo (Bell & Amen, 1970)

CULTURAL PRACTICES

EXPOSURE: Does equally well under all light conditions (USDA, For. Ser., 1937)
SOIL MOISTURE: Wet (USDA, For. Ser., 1937)
ORGANIC MATTER: Highly organic (USDA, For. Ser., 1937)

LUZULA SPICATA (L.) DC.
Spike Woodrush

FAMILY: Juncaceae
LIFE FORM: Perennial native grasslike
FRUIT: Capsule (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill at 5°C for 4 months (Bell & Amen, 1970)
SCARIFICATION: Remove microplyar tip of the seed avoiding damage to the embryo (Bell & Amen, 1970; Amen, 1965)

LABORATORY GERMINATION

COMMENTS: No techniques found capable of breaking dormancy (Sayers, 1963a, 1963b)

LYCURUS PHLEOIDES H. B. K.
Wolftail

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 9.18% in 30 days (Wilson, 1931)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy or gravelly loams preferred (USDA, For. Ser., 1937)

MELICA BULBOSA Geyer
California Melicgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Between middle of Aug and first week in Sep (Sampson, 1924)

PRETREATMENT

STRATIFICATION: Prechill at 2°C for 16 weeks in 10^{-3} M GA_3 (McDonough, 1969)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy or clay loams (USDA, For. Ser., 1937)
SOIL MOISTURE: Moist (USDA, For. Ser., 1937)

MUHLENBERGIA ARENACEA (Buckl.) Hitchc.
Dwarf Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Constant: Room temperature (Haferkamp & McSwain, 1951)

MUHLENBERGIA ARENICOLA Buckl.
Sand Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

GERMINATIVE CAPACITY: 7% in 30 days (Wilson, 1931)

MUHLENBERGIA FILIFORMIS (Thurb.) Rydb.
Pullup Muhly

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy or gravelly (Sampson et al., 1951)

MUHLENBERGIA MONTANA (Nutt.) Hitchc.
Mountain Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Sep 27-Oct 10 (Pearson, 1967)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

MUHLENBERGIA PORTERI Scribn.
Bush Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 2,424,000/lb (Stefferud, 1948)
SEED MATURITY: Between the latter part of Aug and the latter part of Sep (Sampson, 1924)
METHOD OF CLEANING: Impossible to thresh and clean the seed with ordinary equipment (Flory & Marshall, 1942)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 18-6 hours (Toole, 1938)
MOISTURE: Lower Limit: >20 atm (Knipe & Herbel, 1960)
GERMINATIVE CAPACITY: 30% (Stefferud, 1948); 23% (Bridges, 1941)

CULTURAL PRACTICES

EXPOSURE: Fairly tolerant of shade (Sampson, 1924)
SOIL TEXTURE: Sandy loams and sand dune areas (Bridges, 1942)

MUHLENBERGIA RACEMOSA (Michx.) B. S. P.
Green Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Aug and Sep (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Constant: 35°C (Toole, 1938); Fluctuating: 20-35°C at 18-6 hours (Toole, 1938)

CULTURAL PRACTICES

EXPOSURE: Fairly tolerant of shade (Sampson, 1924)
SOIL TEXTURE: Gravelly or sandy soil (Clark & Malte, 1913)
SOIL MOISTURE: Best growth on wet soils (Sampson, 1924)

MUHLENBERGIA RICHARDSONIS (Trin.) Rydb.
Mat Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy, gravelly or clay loams preferred (Sampson et al., 1951; USDA, For. Ser., 1937)

MUHLENBERGIA TORREYI (Kunth) Hitchc.
Ring Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Matures by Aug (USDA, For. Ser., 1937)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy or clay loams preferred (USDA, For. Ser., 1937)

MUHLENBERGIA WRIGHTII Vasey
Spike Muhly

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill dormant seed 3 weeks (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 12-34.5°C constant or fluctuating (Sabo et al., 1979); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
MOISTURE: Lower Limit: -4 bars (Sabo et al., 1979)
LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL TEXTURE: Soil preferences range from clay to gravelly or rocky, but is more characteristic of sandy or clay loams (USDA, For. Ser., 1937)

ORYZOPSIS HYMENOIDES
(Roem. & Schult.) Ricker
Indian Ricegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 10,120/oz, 355/g (AOSA, 1978); 188,000/lb (Vallentine, 1971); 188,295/lb (Plummer et al., 1968); 140,000/lb (Wheeler & Hill, 1957); 141,000/lb (Stefferud, 1948)
SEED MATURITY: Jun 30-Jul 15 (Plummer et al., 1968)
METHOD OF COLLECTION: Hand collect heads or combine (Plummer et al., 1968; Wheeler, 1950); Harvest with combine (Archer & Bunch, 1953; Hoover et al., 1948)
METHOD OF CLEANING: Dry, chop, and fan (Plummer et al., 1968); Process with hammermill (Archer & Bunch, 1953; Hoover et al., 1948); Board and paddle method for small lots (Hull, 1943); Hammermill then screen and fan (Weber, 1939)

BEST DOCUMENT AVAILABLE

PRETREATMENT

DURATION OF GOOD VIABILITY: At least 14 years (Hafenrichter et al., 1968)
STRATIFICATION: Prechill at 5°C for 4 weeks or dark prechill in soil at 5°C for 4 weeks (AOSA, 1978); Prechill at 4°C for 14 days (Geng & Barnett, 1969); Soak 1-2 year old seed in water at 2-4°C for 40 days (Rogler, 1960b)
SCARIFICATION: Germination enhanced by GA_3 and kinetin, inhibited by ABA (McDonald & Khan, 1978); Concentrated H_2SO_4 for 45 minutes (McDonald & Khan, 1977; McDonald, 1976); Acid or mechanical means (Heady, 1975)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C (AOSA, 1978; USDA, 1952); 30°C (McDonald, 1976); Fluctuating: 5-15°C, 15-25°C at 16-8 hours (AOSA, 1978); 5-15°C at 16-8 hours (Clark & Bass, 1970); 17-30°C (Norris & Decker, 1944)
GERMINATIVE ENERGY: 86% in 7 days (McDonald, 1976)
GERMINATIVE CAPACITY: 11% (Stefferud, 1948)
COMMENTS: Peak germination at an age of 6 years (Rogler, 1960b)

CULTURAL PRACTICES

PLANTING DEPTH: 4" (Hafenrichter et al., 1968)
PLANTING TIME: Fall (Hafenrichter et al., 1968)
EXPOSURE: Not shade tolerant (Plummer et al., 1955)
SOIL TEXTURE: Sandy-good, silty-good, clayey-fair to poor (Vallentine, 1971); Sandy (MT Agric. Exp. Sta., 1970; Judd, 1962; USDA, For. Ser., 1937); Sandy to clay (Plummer et al., 1968)
SOIL MOISTURE: Grows well on dry sites (MT Agric. Exp. Sta., 1970; Plummer et al., 1968; Judd, 1962; Plummer et al., 1955; USDA, For. Ser., 1937)
PRECIPITATION: 5-9" annual (Lang et al., 1975)
COMMENTS: Field: Use of seed more than 1 year old recommended (Robertson & Pearse, 1943)

PANICUM CAPILLARE L.
Common Witchgrass

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 697,846/lb (Stevens, 1932)

PRETREATMENT

STRATIFICATION: Prechill at 3-5°C for 28 weeks (Baskin & Baskin, 1969)
SCARIFICATION: H_2SO_4 or mechanical scarification (Rivera & Peters, 1973, 1971)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30-8°C at 10-8-6 hours (Cross, 1931)
GERMINATIVE ENERGY: 87% (Cross, 1931)

PANICUM LANUGINOSUM Ell.
Woolly Dichanthelium

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Moist or dry (Brown, 1979)

PANICUM OBTUSUM H. B. K.
Vine-Mesquite

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 143,000/lb (Vallentine, 1971; Stefferud, 1948); 145,000/lb (Wheeler & Hill, 1957)
SEED MATURITY: Jun or Jul (Archer & Bunch, 1953)
METHOD OF COLLECTION: Harvest with a combine or stripper (Wheeler & Hill, 1957); Hand strip, combine or cut and thresh the hay (Archer & Bunch, 1953); Any machine that will top the stems can be used (Wolff, 1951)
METHOD OF CLEANING: Hammermill at slow speeds then fanning mill (Wheeler & Hill, 1957)

PRETREATMENT

DURATION OF GOOD VIABILITY: 5 years (Wolff, 1951)
SCARIFICATION: Pretreat fresh seed with 71% H_2SO_4 (Toole, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C (Toole, 1940)
GERMINATIVE ENERGY: 15% in 7 days (Wolff, 1951)
GERMINATIVE CAPACITY: 37% (Wolff, 1951); 65% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Archer & Bunch, 1953)
SOIL TEXTURE: Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Fine textured

(Archer & Bunch, 1953); Loam (Stefferud, 1948); Prefers heavy clay but will grow in very sandy (Bridges, 1942)

PANICUM VIRGATUM L.
Switchgrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 13,780-18,595/oz, 485-655/g (AOSA, 1978); 3,000/kg (Heady, 1975); 389,000/lb (Vallentine, 1971; Atkins & Smith, 1967; Stefferud, 1948); 275,000/lb (Cooper et al., 1957); 390,000/lb (Wheeler & Hill, 1957); 370,000-420,000/lb (Hoover et al., 1947)

SEED MATURITY: Sep 1-Oct 30 (Atkins & Smith, 1967); Early fall (Cooper et al., 1957); Sep (Wheeler, 1950; Hoover et al., 1948); Sep in NB and KA, during latter part of Aug in Dakotas (Hoover et al., 1947)

METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967; Cooper et al., 1957); Binder or direct combining (Harmond et al., 1961); Harvest with a binder or combine (Wheeler & Hill, 1957; Wolff, 1951; Wheeler, 1950; Hoover et al., 1948; Hoover et al., 1947); Combine (Archer & Bunch, 1953)

METHOD OF CLEANING: Fanning mill (Wheeler & Hill, 1957; Wolff, 1951; Hoover et al., 1948; Hoover et al., 1947; Smith, 1946)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Wolff, 1951); 8 years (McWilliams, 1950)

STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1978; USDA, 1952)

SCARIFICATION: Rub between two sheets of emery cloth (Sautter, 1962)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 17-30°C, 20-30°C (Norris & Decker, 1944)

LIGHT: Light required (AOSA, 1978; USDA, 1952)

GERMINATIVE ENERGY: 48% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 70% (Atkins & Smith, 1967); 50% (Cooper et al., 1957); 40-50% (Archer & Bunch, 1953); 60% (Wolff, 1951)

COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Allred & Nixon, 1955); 1/2-3/4" (McWilliams, 1955); 1/2-1" (Archer & Bunch, 1953; Stefferud, 1948)

PLANTING TIME: May 10 (McWilliams, 1955); Dec-Jun (Archer & Bunch, 1953); Mar-Apr (Stefferud, 1948)

SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Sandy-good, silty-good, clayey-good (Vallentine, 1971); Sand, silt or clay (Atkins & Smith, 1967); Clay to sand (Allred & Nixon, 1955); Sandy loam (Stefferud, 1948)

SOIL MOISTURE: Adapted to wet (Heady, 1975); High moisture requirement (Cooper et al., 1957); Abundant moisture (Frolik & Keim, 1938); 1/2-2/3 saturation (Blake, 1935)

COMMENTS: Greenhouse: Most seedlings are produced when seeds are planted the second year after harvest (Robocker et al., 1953)

PASPALUM DILATATUM Poir.
Dallisgrass

FAMILY: Gramineae

LIFE FORM: Perennial introduced grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 17,575/oz, 620/g (AOSA, 1978); 340,000/lb (Wheeler & Hill, 1957); 220,000/lb (Stefferud, 1948)

SEED MATURITY: Aug 15-early Oct in LA (Wheeler & Hill, 1957)

METHOD OF COLLECTION: Direct combining or windrowing (Harmond et al., 1961); Direct combining, mowing, windrowing, and combining from windrow (Wheeler & Hill, 1957); Archer & Bunch, 1953; Wolff, 1951; Wheeler, 1950)

METHOD OF CLEANING: Gravity cleaner gives best results (Wheeler & Hill, 1957; Wolff, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (AOSA, 1978; USDA, 1952; Drake, 1951)

LIGHT: Light required (AOSA, 1978; USDA, 1952)

GERMINATIVE ENERGY: 28% in 7 days (Wolff, 1951)

GERMINATIVE CAPACITY: 75-85%, often lower (Wheeler & Hill, 1957); 53% (Wolff, 1951); 70% (Stefferud, 1948)

COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING TIME: Feb and Mar (Archer & Bunch, 1953)

SOIL MOISTURE: Moist (Wheeler & Hill, 1957; Donahue et al., 1956; Hoover et al., 1948)

ORGANIC MATTER: Abundant organic matter (Donahue et al., 1956; Hoover et al., 1948)

PASPALUM STRAMINEUM Nash
Sand Paspalum

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 258,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

GERMINATIVE CAPACITY: 64% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2-1" (Stefferud, 1948); 1-2" (Cassady, 1937)
PLANTING TIME: Feb-Apr (Stefferud, 1948)
SOIL TEXTURE: Sand (Stefferud, 1948; Bridges, 1942)
SOIL DEPTH: Deep (Bridges, 1942)

PHALARIS ARUNDINACEA L.
Reed Canarygrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 33,620/oz, 1,185/g (AOSA, 1978); 1,213,000/kg (Heady, 1975); 506,000/lb (Vallentine, 1971; Hafenrichter, et al., 1968); 530,000 (Wheeler & Hill, 1957); 533,000/lb (Stefferud, 1948)
SEED MATURITY: North-central states--first week in Jul, Pacific coast--late Jul and early Aug (Wheeler & Hill, 1957)
METHOD OF COLLECTION: Combine (Heath & Hughes, 1962); Combine direct, windrow or binder (Harmond et al., 1961); Harvest with grain binders or headers, windrow then combine from the windrow or by hand (Wheeler & Hill, 1957; Wheeler, 1950); Combine or header (Archer & Bunch, 1953)

PRETREATMENT

DURATION OF GOOD VIABILITY: Not more than 5 years (Hafenrichter et al., 1968)
STRATIFICATION: Prechilling not necessary (Vose, 1962; Colbry, 1953)
SCARIFICATION: Scarify with sandpaper (Vose, 1962)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 10-30°C, 15-30°C, 20-35°C at 16-8 hours (Colbry, 1953)
LIGHT: Light required (AOSA, 1978; USDA, 1952); Germination better in light (Vose, 1962)
GERMINATIVE CAPACITY: 80% (Hafenrichter et al., 1968; Stefferud, 1948); 75% or more (Wheeler & Hill, 1957); 20-90% (Wheeler, 1950; Schoth, 1938)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (McKenzie et al., 1946); 1" (Murphy & Army, 1939); Not over 1" (Schoth, 1938)
PLANTING TIME: Late fall in wet areas that can be plowed only in late summer (Hafenrichter et al., 1968); Late summer, spring, or very late fall depending on conditions (Heath & Hughes, 1962); Spring (Archer & Bunch, 1953)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Excellent growth on loams and clays (Schoth, 1938)
SOIL pH: Not suited to salt marsh or alkali soils (Wheeler, 1950; Ahlgren, 1949; Schoth, 1938)
SOIL MOISTURE: Adapted to wet (Heady, 1975; Hafenrichter et al., 1968; Andersen, 1941; Frolik & Frolik, 1941); Moist (MT Agric. Exp. Sta., 1970; Wheeler, 1950; Schoth, 1938)
DRAINAGE: Undrained (MT Agric. Exp. Sta., 1970); Poorly drained (Hafenrichter et al., 1968); Makes a very good growth on high, well-drained, productive soil if supplied with ample moisture for spring and early summer growth (Schoth, 1938)
COMMENTS: Field: Seed harvest with combine should be delayed until 40-50% of the seeds are brown when examined in the field (Griffeth & Harrison, 1954)

PHALARIS CAROLINIANA Walt.
Carolina Canarygrass

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 429,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

GERMINATIVE CAPACITY: 92% (Stefferud, 1948)

PHLEUM ALPINUM L.
Alpine Timothy

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Aug and Sep (USDA, For. Ser., 1937); Latter part of Aug (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)
MOISTURE: Lower Limit: 14% (Sampson, 1917)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 24% in 30 days (Wilson, 1931)

CULTURAL PRACTICES

EXPOSURE: Fairly tolerant to shade (Sampson & Chase, 1927)
SOIL MOISTURE: Moist or wet (USDA, For. Ser., 1937); Moist (Sampson, 1924)

PHLEUM PRATENSE L.
Timothy

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 68,150-77,250/oz, 2,405-2,725/g (AOSA, 1978); 2,865,000/kg (Heady, 1975); 1,230,000/lb (Vallentine, 1971; Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: Jul 21 in southern MO, Aug 5 in northern MN (Wheeler & Hill, 1957)
METHOD OF COLLECTION: Harvest with a combine or binder (Hanson & Evans, 1962; Wheeler & Hill, 1957; Wheeler, 1950); Harvest with a binder or by direct combining (Harmond et al., 1961); Grain combine (Archer & Bunch, 1953)

PRETREATMENT

METHOD OF STORAGE: Cold-dry--5°C and 40% relative humidity (Canode, 1972)
DURATION OF GOOD VIABILITY: At least 14 years (Rincker & Maguire, 1979); At least 10 years (Canode, 1972); 5 years (Hafenrichter et al., 1968); 1 or 2 years (Wheeler & Hill, 1957; Wheeler, 1950); 6 years or more (Hull & Pearse, 1943a)
STRATIFICATION: KNO$_3$ and prechill at 5 or 10°C for 5 days (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C, 20-30°C at 16-8 hours (AOSA, 1978); 20-30°C at 16-8 hours (USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952; Gordon, 1951)
GERMINATIVE ENERGY: 90-100% in 7 days (Gordon, 1951)
GERMINATIVE CAPACITY: 92% (Wheeler & Hill, 1957); 90% (Stefferud, 1948; Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4" on sandy loam, barely covered if the soil is high in clay (Lang et al., 1975); 1/2" (Williams, 1954; Murphy & Arny, 1939); 1/4-1/2" (Archer & Bunch, 1953); Very shallow (Piper, 1924)
PLANTING TIME: Fall (Wheeler & Hill, 1957; Archer & Bunch, 1953; Hoover et al., 1948)
EXPOSURE: Shade tolerant (Plummer et al., 1955; Hull & Pearse, 1943b; Plummer et al., 1943; Robertson & Pearse, 1943)
SOIL TEXTURE: Adapted to loamy (Heady, 1975); Silty-good, clayey-good, sandy-fair (Vallentine, 1971); Grows better on clay loams than on sandy soils (Donahue et al., 1956); Clay loams to light-textured sandy soils (Archer & Bunch, 1953); Clay loam (Hoover et al., 1948): Grows best on clay loams and silt loams (Stewart & Walker, 1939); Clay or loam (USDA, For. Ser., 1937; Forsling & Dayton, 1931, Piper, 1924)
SOIL pH: Adversely affected by high acidity (Beard, 1973; Wheeler, 1950); Best adapted to 6.0-7.0 (Beard, 1973)
SOIL MOISTURE: Adapted to wet (Heady, 1975); Moist to wet (Plummer et al., 1955); 60% of field capacity (Williams, 1954); Moist (Archer & Bunch, 1953)
PRECIPITATION: 15" and over annual (Lang et al., 1975); >20" mean annual (Hafenrichter et al., 1968)
DRAINAGE: Poorly drained (Hafenrichter et al., 1968); Well drained but moist (Archer & Bunch, 1953; USDA, For. Ser., 1937; Forsling & Dayton, 1931); Fairly good drainage (Wheeler, 1950)

POA ALPINA L.
Alpine Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETRATMENT

STRATIFICATION: Chill freshly harvested seed at 10°C for 10 days (Sprague, 1940)

LABORATORY GERMINATION

TEMPERATURE: Constant: 10°C (Sprague, 1940)
GERMINATIVE ENERGY: 66% in 7 days (Sprague, (1940)
GERMINATIVE CAPACITY: 98% in 14 days (Sprague, 1940)

POA AMPLA Merr.
Big Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 2,022,000/kg (Heady, 1975); 900,000/lb (Vallentine, 1971; Wheeler & Hill, 1957); 882,000/lb (Stefferud, 1948)
METHOD OF COLLECTION: Can be combined, but better results by binding, shocking and threshing (Wheeler & Hill, 1957); Grain combine or stripper (Archer & Bunch, 1953)

PRETREATMENT

DURATION OF GOOD VIABILITY: Approximately 5 years (Hull & Pearse, 1943a)
STRATIFICATION: Prechill 7 days at 5°C (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 10-30°C, 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: Sherman big bluegrass--70% (Wheeler & Hill, 1957); 49% (Stefferud, 1948); 80% (Hull & Pearse, 1943a)

CULTURAL PRACTICES

PLANTING DEPTH: 5/8" (Currie, 1967); Not to exceed 3/4" (Wheeler & Hill, 1957); 1/2" (Archer & Bunch, 1953)
PLANTING TIME: During Jul and Aug (Currie, 1967); Fall in areas of light soil and low rainfall, spring in areas of heavier soils and more rainfall (Wheeler & Hill, 1957); Best results from fall plantings but also can plant in the spring (Archer & Bunch, 1953)
SOIL TEXTURE: Adapted to loamy (Heady, 1975); Sandy-good, silty-good, clayey-good (Vallentine, 1971)
SOIL MOISTURE: Moderate moisture (Hull & Johnson, 1955)

POA ANNUA L.
Annual Bluegrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 74,730/oz, 2,635/g (AOSA, 1978); 1,196,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 80% (Stefferud, 1948)

CULTURAL PRACTICES

EXPOSURE: Well adapted to shaded environments (Beard, 1973; Sprague & Burton, 1937)
SOIL TEXTURE: Fine-textured (Beard, 1973)
SOIL pH: 5.5-6.5 (Beard, 1973)
SOIL MOISTURE: Moist (Youngner, 1959)

POA ARIDA Vasey
Plains Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

POA BULBOSA L.
Bulbous Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Panicle produces bulbils rather than seed (Wheeler & Hill, 1957; Hoover et al., 1948)

PROCUREMENT

SEEDS/UNIT WT: 16,640/oz, 585/g (AOSA, 1978); 460,000/lb (Vallentine, 1971); 463,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: May 1-May 15 (Hoover et al., 1948)
METHOD OF COLLECTION: Direct combining is possible (Wheeler & Hill, 1957); Mowing machine with a swather (Archer & Bunch, 1953; Hoover et al., 1948)

PRETREATMENT

METHOD OF STORAGE: Store in sealed containers at 10 or 2°C (Toole, 1941a)
DURATION OF GOOD VIABILITY: 5 or more years (Hull & Pearse, 1943a)
STRATIFICATION: Prechill at 5°C for 7 days (AOSA, 1978; USDA, 1952; Toole, 1941a)

LABORATORY GERMINATION

TEMPERATURE: Constant: 10°C (AOSA, 1978; USDA, 1952; Toole, 1941a)

GERMINATIVE CAPACITY: 86% (Stefferud, 1948); 90% (Hull & Pearse, 1943a)
COMMENTS: Moisten substratum with 0.2% KNO_3 or germinate in soil (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: Surface (Plummer, 1943)
PLANTING TIME: Late summer and early fall (Hull, 1948)
EXPOSURE: Shade tolerance is fairly good but best growth occurs in full sunlight (Beard, 1973)
SOIL TEXTURE: Silty-good, clayey-good, sandy-fair (Vallentine, 1971)
SOIL DEPTH: Shallow (Hafenrichter et al., 1968)

POA CANBYI (Scribn.) Piper
Canby Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 926,000/lb (Hafenrichter et al., 1968)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 75% (Hafenrichter et al., 1968)

CULTURAL PRACTICES

PLANTING TIME: Late fall (Hafenrichter et al., 1968)
SOIL DEPTH: Shallow (Hafenrichter et al., 1968)

POA COMPRESSA L.
Canada Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 143,165/oz, 5,050/g (AOSA, 1978); 2,500,000/lb (Hafenrichter et al., 1968; Wheeler & Hill, 1957); 2,495,000/lb (Stefferud, 1948)
METHOD OF COLLECTION: Grain combine (Archer & Bunch, 1953)

PRETREATMENT

STRATIFICATION: Chill freshly harvested seed at 10°C for 10 days (Sprague, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C, 15-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 15-25°C at 16-8 hours (Cuddy, 1963); 10-30°C, 15-30°C at 16-8 hours (Andersen, 1947a); Room-30°C, 15-30°C, 20-30°C at 18-6 hours (Andersen, 1939); 15-32°C at 18-6 hours (Morinaga, 1926)
LIGHT: Light required (AOSA, 1978; USDA, 1952; Andersen, 1947a, 1935, 1932; Hite, 1919)
GERMINATIVE CAPACITY: 75% (Hafenrichter et al., 1968); 80% (Stefferud, 1948)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: <1/2" (Short, 1943)
EXPOSURE: Open (Archer & Bunch, 1953); Not adapted to shady situations (Bridges, 1942)
SOIL TEXTURE: Fine textured to gravelly (Beard, 1973); Gravel and thin soils over rock or on clay (Bridges, 1942)
SOIL pH: 5.5-6.5 (Beard, 1973); Medium acid (Hafenrichter et al., 1968)
SOIL DEPTH: Shallow (Bridges, 1942)
SOIL MOISTURE: Dry (Archer & Bunch, 1953)
DRAINAGE: Imperfectly drained to well drained (Beard, 1973)

POA EPILIS Scribn.
Skyline Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill 2 weeks (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

POA FENDLERIANA (Steud.) Vasey
Muttongrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Between Jul 15 and Aug 15 (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL TEXTURE: Best adapted to clay loam (Archer & Bunch, 1953); Clay loam (Hoover et al., 1948); Clay loam preferred (USDA, For. Ser., 1937)
SOIL MOISTURE: Moderately moist (Sampson, 1924)
DRAINAGE: Well drained (Archer & Bunch, 1953; Hoover et al., 1948; USDA, For. Ser., 1937)

POA GRACILLIMA Vasey
Pacific Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

POA INTERIOR Rydb.
Inland Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

POA JUNCIFOLIA Scribn.
Alkali Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 1,000,000/lb (Hafenrichter et al., 1968)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 65% (Hafenrichter et al., 1968)

POA NEMORALIS L.
Wood Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 122,725/oz, 4,330/g (AOSA, 1978)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)

CULTURAL PRACTICES

EXPOSURE: Shade tolerant (Piper, 1924)

POA NERVOSA (Hook.) Vasey
Wheeler Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Latter part of Aug or first part of Sep (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL MOISTURE: Dry (Sampson, 1924)

POA NEVADENSIS Vasey
Nevada Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 65,434/oz, 2,304/g (AOSA, 1978); 1,082,000/lb (Hafenrichter et al., 1968; Stefferud, 1948); 1,000,000/lb (Wheeler & Hill, 1957)
SEED MATURITY: Aug 15 and Sep 10 (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 65% (Hafenrichter et al., 1968); 64% (Stefferud, 1948)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy or loamy (USDA, For. Ser., 1937)
SOIL pH: Medium acid to moderately alkaline (Hafenrichter et al., 1968)
SOIL MOISTURE: Wet (Hafenrichter et al., 1968)

POA PALUSTRIS L.
Fowl Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Chill freshly harvested seed at 10°C for 10 days (Sprague, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C at 16-8 hours (Cuddy, 1963)
GERMINATIVE ENERGY: 82% in 14 days (Sprague, 1940)
GERMINATIVE CAPACITY: 100% in 28 days (Sprague, 1940)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Brown, 1979)

POA PRATENSIS L.
Kentucky Bluegrass

FAMILY: Gramineae
LIFE FORM: Perennial naturalized grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 53,845-109,885/oz, 2,250-3,875/g (AOSA, 1978); 4,754,000/kg (Heady, 1975); 2,150,000/lb (Vallentine, 1971); 2,156,000/lb (Hafenrichter et al., 1968); 2,200,0-0/lb (Wheeler & Hill, 1957); 2,117,000/lb (Stefferud, 1948)
SEED MATURITY: Second or third week in Jun in KT and MO (Wheeler & Hill, 1957)
METHOD OF COLLECTION: Harvest by stripping (Fergus, 1962; Harmond et al., 1951; Wheeler & Hill, 1957; Wheeler, 1950; Card, 1955); Grain combine or stripper (Archer & Bunch, 1953)

PRETREATMENT

DURATION OF GOOD VIABILITY: Less than 4 years (Garman & Vaughn, 1916)
STRATIFICATION: Prechill at 10°C for 5 days (AOSA, 1978; USDA, 1952). Chill moist seed between 5 and 15°C for 10 days (Sprague, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-25°C at 16-8 hours (AOSA, 1978; Toole & Borthwick, 1971; Cuddy, 1963); 15-30°C at 16-8 hours (USDA, 1952; Andersen, 1941); 10-30°C 15-30°C at 16-8 hours (Sprague, 1940); Room-30°C, 12-30°C, 20-30°C at 18-6 hours (Andersen, 1939)
LIGHT: Light required (AOSA, 1978; USDA, 1952; Andersen, 1941; Waldron, 1921); Brief daily illuminances of high intensity are most promotive to germination (Toole & Borthwick, 1971)
GERMINATIVE ENERGY: 91% in 14 days (Sprague, 1940)
GERMINATIVE CAPACITY: 75% (Hafenrichter et al., 1968); Over 80% (Wheeler & Hill, 1957); 80% (Stefferud, 1948); 94% in 28 days (Sprague, 1940)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: No deeper than 1/4" (Rogler et al., 1961); 1/4" (Plummer et al., 1943); 1/2" (Murphy & Arny, 1939)
EXPOSURE: Full sunlight or only slight shading preferred (Beard, 1973); Moderately shade tolerant (Hafenrichter et al., 1968; Fergus, 1962)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Silty-good, clayey-good, sandy-poor (Vallentine, 1971); Loams and heavier

types of soils (Fergus, 1962); Medium texture (Archer & Bunch, 1953; Wheeler, 1950); Loams or clay loams (Stewart & Walker, 1939; USDA, For. Ser., 1937)

SOIL pH: 6.0-7.0 (Beard, 1973); Nearly neutral (Hafenrichter et al., 1968); 5.8-8.2 (Wheeler, 1950)

SOIL MOISTURE: Adapted to wet (Heady, 1975); Moist (Beard, 1973; Archer & Bunch, 1953: Wheeler, 1959)

PRECIPITATION: 20-50" annual (Fergus, 1962)

DRAINAGE: Well drained (Beard, 1973; Hafenrichter et al., 1968; Fergus, 1962; Archer & Bunch, 1953; Wheeler, 1950; Stewart & Walker, 1939; USDA, For. Ser., 1937)

POA SCABRELLA (Thurb.) Benth.
Pine Bluegrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Between Jun and Sep (Sampson, 1924)

PRETREATMENT

STRATIFICATION: Prechill 2 weeks (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Constant: 29°C (Haferkamp & McSwain, 1951)

LIGHT: Light required (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL MOISTURE: Fairly dry (Sampson, 1924)

POA SANDBERGII Vasey
Sandberg Bluegrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 925,000/lb (Hafenrichter et al., 1968; Stefferud, 1948); 900,000/lb (Wheeler & Hill, 1957)

SEED MATURITY: First part of Jul (Hoover et al., 1948); Early summer (Sampson, 1924)

METHOD OF COLLECTION: Harvest with small grain combine (Hoover et al., 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 5-20°C, 10-20°C, 15-20°C at 16-8 hours (Evans et al., 1977); 12-17°C at 16-8 hours (McDonough, 1970); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

LIGHT: Light required (Haferkamp & McSwain, 1951)

GERMINATIVE CAPACITY: 81% in 28 days (McDonough, 1970); 65% (Hafenrichter et al., 1968); 66% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: Burial greater than 3 cm inhibits emergence (Evans et al., 1977)

PLANTING TIME: Fall (Douglas et al., 1960)

SOIL TEXTURE: Grows best in clay loam, also inhabits rocky or sandy soils (USDA, For. Ser., 1937)

SOIL DEPTH: Shallow (Hafenrichter et al., 1968)

SOIL MOISTURE: Dry (Sampson, 1924)

POA STENANTHA Trin.
Trinius Bluegrass

FAMILY: Gramineae

LIFE FORM: Perennial native grass

FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)

POA TRIVIALIS L.
Rough Bluegrass

FAMILY: Gramineae

LIFE FORM: Perennial introduced grass

FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 158,760/oz, 5,600/g (AOSA, 1978); 2,500,000/lb (Wheeler & Hill, 1957); 2,540,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952); 15-25°C at 16-8 hours (Cuddy, 1963)

LIGHT: Light required (AOSA, 1978; USDA, 1952; Chippendale, 1932)

GERMINATIVE CAPACITY: 95% (Budd, 1970); 80% (Wheeler & Hill, 1957; Stefferud, 1948)

CULTURAL PRACTICES

EXPOSURE: Tolerant to shade (Fergus, 1962; Piper, 1934); Grows best in shade (Sprague & Evaul, 1930)

SOIL pH: 6-7 best (Beard, 1973)

SOIL MOISTURE: Moist (Wheeler, 1950; Piper, 1934, 1924; Sprague & Evaul, 1930)

POLYPOGON MONOSPELIENSIS (L.) Desf.
Rabbitfootgrass

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C, room temperature to 30°C at 18-6 hours (Toole, 1938)
LIGHT: Light required (Toole, 1938)
COMMENTS: Germination promoted by KNO_3 at alternating temperatures (Toole, 1938)

PUCCINELLIA AIROIDES (Nutt.) Wats. & Coult.
Nuttall Alkaligrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 2,108,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 62% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL pH: Strongly alkaline (ND Agric. Exp. Sta., 1941)
SOIL MOISTURE: Wet (ND Agric. Exp. Sta., 1941)

REDFIELDIA FLEXUOSA (Thurb.) Vasey
Blowoutgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 263,000/lb (Stefferud, 1948)

LABORATORY GERMINATION

GERMINATIVE CAPACITY: 23% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL TEXTURE: Sand (ND Agric. Exp. Sta., 1941)

SCHEDONNARDUS PANICULATUS (Nutt.) Trel.
Tumblegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL TEXTURE: Sandy (Ohlenbusch, 1976)

SCIRPUS ACUTUS Muhl.
Tule Bulrush

FAMILY: Cyperaceae
LIFE FORM: Perennial native emergent grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Stratify on peat moss at 2-4°C for 6 months (Isely, 1944b); No germination obtained after stratification (Muenscher, 1936)

LABORATORY GERMINATION

LIGHT: Simulatory effect of light not nearly so marked as for many other *Scirpus* species (Isely, 1944a)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Harrington, 1964)

SCIRPUS AMERICANUS Pers.
American Bulrush

FAMILY: Cyperaceae
LIFE FORM: Perennial native emergent grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 206,303/lb (Swingle, 1939)

PRETREATMENT

STRATIFICATION: Stratify on peat moss at 2-4°C for 6 to 12 months (Isely, 1944b); Poor germination after stratification (Muenscher, 1936)

CULTURAL PRACTICES

SOIL MOISTURE: Wet or moist (Harrington, 1964)

SCIRPUS NEVADENSIS S. Wats.
Nevada Bulrush

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 477,895/lb (Swingle, 1939)

CULTURAL PRACTICES

SOIL pH: Alkaline (Harrington, 1964)
SOIL MOISTURE: Moist or wet (Harrington, 1964)

SCIRPUS PALUDOSUS A. Nels.
Alkali Bulrush

FAMILY: Cyperaceae
LIFE FORM: Perennial native grasslike
FRUIT: Achene (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 139,692/lb (Swingle, 1939)

PRETREATMENT

STRATIFICATION: 3-6 months of moist stratification at 2-4°C (Isely, 1944a, 1944b)
SCARIFICATION: 0.05% sodium hypochlorite (O'Neill, 1972); Cannot be induced to germinate by H_2SO_4 treatment or by mechanical methods (Isely, 1944a)

LABORATORY GERMINATION

LIGHT: Light required (Isely, 1944b)

CULTURAL PRACTICES

EXPOSURE: Exposed, sunny site (O'Neill, 1972)
SOIL MOISTURE: Moist or wet (Harrington, 1964)

SCIRPUS VALIDUS Vahl
Softstem Bulrush

FAMILY: Cyperaceae
LIFE FORM: Perennial native emergent grasslike
FRUIT: Achene (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Stratify on peat moss at 2-4°C for 18-24 months (Isely, 1944b); Poor germination after stratification (Muenscher, 1936)

LABORATORY GERMINATION

LIGHT: Light required (Isely, 1944b)

CULTURAL PRACTICES

SOIL MOISTURE: Wet (Brown, 1979)

SETARIA GLAUCA (L.) Beauv.
Yellow Foxtail

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Hitchcock, 1971)

PROCUREMENT

SEEDS/UNIT WT: 108,000/lb (Stevens, 1932)

PRETREATMENT

SCARIFICATION: Immersion in H_2SO_4 for 30 minutes or rubbing with sandpaper (Peters & Yokum, 1961)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30-8°C at 10-8-6 hours (Cross, 1931)
GERMINATIVE ENERGY: 86% (Cross, 1931)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Dawson & Bruns, 1962)

SETARIA ITALICA (L.) Beauv.
Foxtail Millet

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 11,510-15,565/oz, 405-550/g (AOSA, 1978); 220,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
METHOD OF COLLECTION: First bind or windrow then thresh with a combine (Wheeler & Hill, 1957; Hoover et al., 1948)

PRETREATMENT

DURATION OF GOOD VIABILITY: 2 years if kept in good storage (Hoover et al., 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-30°C, 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
GERMINATIVE CAPACITY: 90% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1" (Wheeler & Hill, 1957)

SETARIA MACROSTACHYA H. B. K.
Plains Bristlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 293,000/lb (Atkins & Smith, 1967); 305,000/lb (Stefferud, 1948)
SEED MATURITY: Jun 1-Jul 15 (Atkins & Smith, 1967)
METHOD OF COLLECTION: Combine preferred, also windrower (Atkins & Smith, 1967); Direct combining or stripper (Harmond et al., 1961); Combine or strip by hand (Archer & Bunch, 1953)

PRETREATMENT

STRATIFICATION: Prechill at 3 or 10°C (Toole, 1940)
SCARIFICATION: Pretreat with 71% H_2SO_4 for 15-30 minutes (Toole, 1940)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 10-35°C or 35-10°C (Toole, 1940)
MOISTURE: Lower Limit: 16 atm (Tapia & Schmutz, 1971)
LIGHT: Better germination in darkness (Tapia & Schmutz, 1971)
GERMINATIVE CAPACITY: 60% (Atkins & Smith, 1967); 23% (Stefferud, 1948)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Archer & Bunch, 1953)
PLANTING TIME: Spring (Archer & Bunch, 1953)
SOIL TEXTURE: Sand, silt or clay (Atkins & Smith, 1957; Archer & Bunch, 1953); Grows well on light sandy soils, also on clay loams (Bridges, 1942)
SOIL DEPTH: Deep or shallow (Archer & Bunch, 1953)
SOIL MOISTURE: Extremely dry (Archer & Bunch, 1953)

SETARIA VIRIDIS (L.) Beauv.
Green Foxtail

FAMILY: Gramineae
LIFE FORM: Annual introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 307,525/lb (Stevens, 1932)

PRETREATMENT

STRATIFICATION: Prechill at 6°C for 3-6 weeks (Vanden Born, 1971)

LABORATORY GERMINATION

TEMPERATURE: Constant: At or above 25°C (Vanden Born, 1971)

CULTURAL PRACTICES

PLANTING DEPTH: 0.5-8 cm (Vanden Born, 1971); 1/2" (Dawson & Bruns, 1962)

SITANION HYSTRIX (Nutt.) J. G. Smith
Bottlebrush Squirreltail

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 191,555/lb (Plummer et al., 1968)
SEED MATURITY: Jul 15-Aug 15 (Plummer et al., 1968)
METHOD OF COLLECTION: Hand collect or combine (Plummer et al., 1968)
METHOD OF CLEANING: Dry, chop and fan (Plummer et al., 1968); Board and paddle method for small lots (Hull, 1943); Mill threshed seed in a hammermill and clean with a seed cleaner (Schwendiman et al., 1940)

LABORATORY GERMINATION

TEMPERATURE: Constant: 15°C (Young & Evans, 1977); Fluctuating: 10-15°C, 10-20°C (Young & Evans, 1977)
GERMINATIVE CAPACITY: 98% in 28 days (McDonough, 1970)

CULTURAL PRACTICES

SOIL TEXTURE: Gravelly (Morris et al., 1950)
SOIL pH: Saline or alkaline (Morris et al., 1950)
SOIL MOISTURE: Dry (Ohlenbusch, 1976; Morris et al., 1950)

SORGHASTRUM NUTANS (L.) Nash
Indiangrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 9,865-12,530/oz, 350-440/g (AOSA, 1978); 385,000/kg (Heady, 1975); 170,000/lb (Vallentine, 1971; Atkins & Smith, 1967; Cooper et al., 1957); 175,000/lb (Wheeler & Hill, 1957; Stefferud, 1948)
SEED MATURITY: Sep 1-Oct 30 (Atkins & Smith, 1967); Late fall (Cooper et al., 1957); Sep-frost or even later (Wheeler & Hill, 1957)
METHOD OF COLLECTION: Combine preferred, also binder (Atkins & Smith, 1967; Cooper et al., 1957); Binder or direct combining (Harmond et al., 1961); Harvest with a binder or combine (Wheeler & Hill, 1957); Grain combine (Archer & Bunch, 1953); Combine, binder or top with a sickle (Wolff, 1951); Stripping and threshing (Frolik & Keim, 1938)
METHOD OF CLEANING: Hammermill run at low speeds or fanning mill (Wheeler & Hill, 1957; Wolff, 1951)

PRETREATMENT

DURATION OF GOOD VIABILITY: Exceeds 2 years (Wheeler & Hill, 1957; Wolff, 1951); 6 years (Blake, 1935)
STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1978, USDA, 1952); Moist chilling for 4 weeks (Emal & Conard, 1973)
SCARIFICATION: Soak spikelets in concentrated H_2SO_4 for 10 minutes (Emal & Conard, 1973)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (AOSA, 1978; USDA, 1952)
LIGHT: Light required (AOSA, 1978; USDA, 1952); Red light more effective than daylight when exposure time is 2 hours or less (Emal & Conard, 1973)
GERMINATIVE ENERGY: 35% in 7 days (Wheeler & Hill, 1957; Wolff, 1951)
GERMINATIVE CAPACITY: 60% (Atkins & Smith, 1967); 40% (Cooper et al., 1957); 63% Wheeler & Hill, 1957; Stefferud, 1948); 62% (Wolff, 1951)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/2" (Allred & Nixon, 1955); 1/3-1" (Archer & Bunch, 1953; Stefferud, 1948)
PLANTING TIME: Dec-Jun (Archer & Bunch, 1953); Mar-Apr (Stefferud, 1948)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Sandy-good, silty-good, clayey-fair (Vallentine, 1971); Sand, silt or clay (Atkins & Smith, 1967); Clay to sand (Allred & Nixon, 1955); Sandy loam (Stefferud, 1948)
SOIL MOISTURE: Adapted to wet (Heady, 1975); High moisture requirement (Cooper et al., 1957); Moist (Frolik & Keim, 1938)
DRAINAGE: Well drained (Frolik & Keim, 1938)
COMMENTS: Greenhouse: Seedlings produced equally well when seeds are planted 1, 2 or 3 years after harvest (Robocker et al., 1953)

SORGHUM HALEPENSE (L.) Pers.
Johnsongrass

FAMILY: Gramineae
LIFE FORM: Perennial introduced grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 118,000/lb (Vallentine, 1971; Wheeler & Hill, 1957; Stefferud, 1948)
METHOD OF COLLECTION: Bind and shock (Wheeler & Hill, 1957); Grain binder or mower and rake (Wheeler, 1950)

PRETREATMENT

STRATIFICATION: Prechill 2 weeks at 10°C (Taylorson & McWhorter, 1969)
SCARIFICATION: Remove the hulls, immerse in concentrated H_2SO_4 for 2 minutes, puncture the seed coat (Harrington, 1916)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (AOSA, 1978; Taylorson & McWhorter, 1969; Weir, 1959; USDA, 1952); 25-40°C at 16-8 hours (Harrington, 1916)
LIGHT: Light required (AOSA, 1978; Taylorson & McWhorter, 1969; USDA, 1952)
GERMINATIVE ENERGY: 51% in 3 days (Harrington, 1916)
GERMINATIVE CAPACITY: 85% (Stefferud, 1948); 88% in 16 days (Harrington, 1916)
COMMENTS: Germination in the dark promoted by KNO_3 (Mayer & Poljakoff-Mayber, 1975)

CULTURAL PRACTICES

PLANTING DEPTH: 1-2" (Archer & Bunch, 1953; Allred, 1950)
PLANTING TIME: 2 weeks after corn planting to Jul 1 (Archer & Bunch, 1953)
SOIL TEXTURE: Sandy-good, silty-good, clayey-good (Vallentine, 1971); Best adapted to heavy clay but also grows well on fine sandy loams (Bennett, 1962); Sandy loam (Stefferud, 1948)

SPARTINA PECTINATA Link
Sloughgrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

CULTURAL PRACTICES

SOIL MOISTURE: Wet for at least several weeks of each year (Frolik & Keim, 1938)

SPOROBOLUS AIROIDES (Torr.) Torr.
Alkali Sacaton

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964); Achene (Arber, 1934)

PROCUREMENT

SEEDS/UNIT WT: 1,750,000/lb (Vallentine, 1971; Hafenrichter et al., 1968; Wheeler & Hill, 1957); 1,758,000/lb (Stefferud, 1948)
SEED MATURITY: Aug and Sep (Sampson, 1924)
METHOD OF COLLECTION: Harvest with a combine or by threshing mature seed hay (Hoover et al., 1948; Hoover, 1939); Bluegrass stripper (Frolik & Keim, 1938)

PRETREATMENT

DURATION OF GOOD VIABILITY: Over 4 years (Knipe, 1969)

LABORATORY GERMINATION

TEMPERATURE: Constant: 90°F (Knipe, 1967); Fluctuating: 68-86°F (Knipe, 1967)
MOISTURE: Optimum: 0 atm (Aldon, 1975; Knipe, 1968)
LIGHT: Inhibited by light (Knipe, 1971)
GERMINATIVE CAPACITY: 80% (Hafenrichter et al., 1968; Stefferud, 1948)

CULTURAL PRACTICES

PLANTING TIME: Plant at a time when the probability for rain or flooding for 15 days is above 80% (Aldon, 1970)
SOIL TEXTURE: Clayey-good, silty-fair, sandy-poor (Vallentine, 1971); Moderately fine textured (Hafenrichter et al., 1968); From coarse sand to clay loam (Sampson, 1924)
SOIL pH: Alkaline (Hafenrichter et al., 1968; Judd, 1962; Hoover et al., 1948; Stefferud, 1948; Frolik & Keim, 1938)
SOIL MOISTURE: Soil moisture at least 14% or higher (Aldon, 1975); Slightly moist (Judd, 1962); Moist (Hoover et al., 1948); Wet (Stefferud, 1948; Frolik & Keim, 1938)

SPOROBOLUS ASPER (Michx.) Kunth
Tall Dropseed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964); Achene (Arber, 1934)

PROCUREMENT

SEEDS/UNIT WT: 503,000/lb (Stefferud, 1948); 697,846/lb (Stevens, 1932)

PRETREATMENT

DURATION OF GOOD VIABILITY: 6 years (Blake, 1935)
SCARIFICATION: Pretreat fresh seed with 71% H_2SO_4 for 2-4 minutes (Toole, 1941b)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 17-30°C, 20-30°C at 16-8 hours (Norris & Decker, 1944); 20-35°C at 16-8 hours (Toole, 1941b)
GERMINATIVE CAPACITY: 80% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL MOISTURE: Dry (Brown, 1979); Moist to dry (Frolik & Keim, 1938)

SPOROBOLUS CONTRACTUS Hitchc.
Spike Dropseed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964): Achene (Arber, 1934)

PROCUREMENT

SEEDS/UNIT WT: 3,000,000/lb (Flory & Marshall, 1942)

PRETREATMENT

SCARIFICATION: Acid scarify (Sabo et al., 1979); Pretreat fresh seed with 71% H_2SO_4 for 4 minutes (Toole, 1941b)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15.5 to 19°C-26.5 to 29.5°C at 8-16 hours (Sabo et al., 1979); 20-35°C at 16-8 hours (Toole, 1941b)
MOISTURE: Lower Limit: -2 bars (Sabo et al., 1979)
GERMINATIVE CAPACITY: 1.54% in 30 days (Wilson, 1931)

SPOROBOLUS CRYPTANDRUS (Torr.) A. Gray
Sand Dropseed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964); Achene (Arber, 1934)

PROCUREMENT

SEEDS/UNIT WT: 350,005/oz, 12,345/g (AOSA, 1978); 5,000,000/lb (Vallentine, 1971); 5,300,000/lb (Wheeler & Hill, 1957)
SEED MATURITY: Late summer (Archer & Bunch, 1953)
METHOD OF COLLECTION: Harvest with a small grain combine (Archer & Bunch, 1953; Hoover et al., 1948); Power stripper (Hoover, 1939)
METHOD OF CLEANING: Use graduated screens and an air blast blower (Sayers, 1968)

PRETREATMENT

DURATION OF GOOD VIABILITY: 1-5 years (Archer & Bunch, 1953)
STRATIFICATION: Prechill at 5°C for 4 weeks (AOSA, 1978; USDA, 1952); Prechill at 3°C for 4-8 weeks (Toole, 1941b)
SCARIFICATION: Acid scarify (Sabo et al., 1979); Maximum promotion of germination obtained by clipping seeds with a razor blade, pricking them with a needle, or by treating air dry seeds in a forced air oven 35 minutes at 95-100°C (Sayers, 1968); 71% H_2SO_4 for 2 minutes (Toole, 1941b)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 11 to 27-35 to 37 at 8-16 hours (Sabo et al., 1979); 5-35°C, 15-35°C at 16-8 hours (AOSA, 1978; USDA, 1952); 5-35°C at 9-15 hours (Sayers, 1968); 15-25°C, 20-30°C (Norris & Decker, 1944); Room temperature-35°C (Toole, 1941b)
MOISTURE: Lower Limit: -4 bars (Sabo et al., 1979)
LIGHT: Light required (Sabo et al., 1979; AOSA, 1978; USDA, 1952): Higher germination in light (Sayers, 1968)
GERMINATIVE CAPACITY: 80% (Stefferud, 1948)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1/4-1/2" (Allred & Nixon, 1955); 1/2" (Stefferud, 1948); <1/2" (Flory & Marshall, 1942)
PLANTING TIME: Mar (Hyder et al., 1975); Mar-Apr (Stefferud, 1948)
EXPOSURE: Grows best in openings (Plummer et al., 1955)
SOIL TEXTURE: Sandy-good, silty-good, clayey-fair (Vallentine, 1971); Sandy (Hawk & Schwendiman, 1962: USDA, For. Ser., 1937); Loam to sand (Allred & Nixon, 1955); Sand, sandy loam (Stefferud, 1948); Common on sandy soils and also heavier soils (Frolik & Keim, 1938)
SOIL MOISTURE: Dry (Frolik & Keim, 1938)

SPOROBOLUS GIGANTEUS Nash.
Giant Dropseed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964); Achene (Arber, 1934)

PROCUREMENT

SEEDS/UNIT WT: 1,723,000/lb (Stefferud, 1948); About 2,000,000/lb (Flory & Marshall, 1942)

PRETREATMENT

SCARIFICATION: Pretreat fresh seed with 71% H_2SO_4 7-9 minutes (Haferkamp & McSwain, 1951; Toole, 1941b)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-35°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 30% (Stefferud, 1948)

SPOROBOLUS HETEROLEPIS (A. Gray) A. Gray
Prairie Dropseed

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964); Achene (Arber, 1934)

CULTURAL PRACTICES

SOIL TEXTURE: Wide tolerance in relation to soil type but found more abundantly on sandy soil (ND Agric. Exp. Sta., 1941)

SPOROBOLUS NEGLECTUS Nash
Puffsheath Dropseed

FAMILY: Gramineae
LIFE FORM: Annual native grass
FRUIT: Caryopsis (Harrington, 1964); Achene (Arber, 1934)

PROCUREMENT

SEEDS/UNIT WT: 864,000/lb (Stevens, 1932)

STIPA ARIDA Jones
Mormon Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

PLANTING DEPTH: 3/4" (Plummer, 1943)

STIPA COLUMBIANA Macoun
Columbia Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Aug and Sep (Sampson, 1924)

PRETREATMENT

STRATIFICATION: Prechill 2 weeks (Haferkamp & McSwain, 1951)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 12-17°C at 16-8 hours (McDonough, 1970); 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 76% in 28 days (McDonough, 1970)

CULTURAL PRACTICES

DRAINAGE: Well drained (Sampson, 1924)

STIPA COMATA Trin. & Rupr.
Needleandthread

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 115,000/lb (Stefferud, 1948)
SEED MATURITY: Jul (Wheeler & Hill, 1957; Donahue et al., 1956; Archer & Bunch, 1953; Wheeler, 1950; Hoover et al., 1948)
METHOD OF CLEANING: Hammermill (Wheeler & Hill, 1957; Hoover et al., 1948); Board and paddle method for small lots (Hull, 1943)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 13% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL MOISTURE: Dry (Frolik & Keim, 1938; Sampson, 1924)

STIPA LETTERMANNI Vasey
Letterman Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 115,000/lb (Mirov & Kraebel, 1937)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)

STIPA OCCIDENTALIS Thurb.
Western Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Jul and Aug (Sampson et al., 1951)

CULTURAL PRACTICES

DRAINAGE: Well drained (USDA, For. Ser., 1937; Sampson, 1917)

STIPA RICHARDSONI Link
Richardson Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

STRATIFICATION: Prechill 10 days at 1°C (McLean, 1967)
SCARIFICATION: Not needed (McLean, 1967)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 100% (McLean, 1967)

STIPA ROBUSTA (Vasey) Scribn.
Sleepygrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEED MATURITY: Aug and Sep (Sampson, 1924)

LABORATORY GERMINATION

TEMPERATURE: Constant: 20°C (Haferkamp & McSwain, 1951)

CULTURAL PRACTICES

SOIL MOISTURE: Moderately moist (Sampson, 1924)

STIPA SPARTEA Trin.
Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PRETREATMENT

DURATION OF GOOD VIABILITY: 3 years (Blake, 1935)

STIPA SPECIOSA Trin. & Rupr.
Desert Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 172,000/lb (Mirov, 1940)
SEED MATURITY: May and Jun (Sampson et al., 1951)

CULTURAL PRACTICES

SOIL MOISTURE: Dry (Sampson & Chase, 1927)

STIPA VIRIDULA Trin.
Green Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 370/g (AOSA, 1978); 400,000/kg (Heady, 1975); 181,000/lb (Vallentine, 1971; Atkins & Smith, 1967; Stefferud, 1948); 180,000/lb (Wheeler & Hill, 1957; Cooper et al., 1957); 175,000-190,000/lb (Hoover et al., 1947)
SEED MATURITY: Jun 1-Jul 15 (Atkins & Smith, 1967); Early summer (Cooper et al., 1957); Late Jun in ND, earlier farther south (Wheeler & Hill, 1957); Jun and early Jul (Archer & Bunch, 1953); Early Jul (Hoover et al., 1948); Early Jul in ND and earlier to the south (Hoover et al., 1947)
METHOD OF COLLECTION: Binding preferred, also windrow or combine (Atkins & Smith, 1967); Binder preferred, also stripper or combine (Cooper et al., 1957); Binding, heading or swathing followed by threshing (Wheeler & Hill, 1957; Wheeler, 1950; Hoover et al., 1948; Hoover et al., 1947); Combine, binding, heading or swathing followed by threshing (Archer & Bunch, 1953); Power stripper (Hoover, 1939)
METHOD OF CLEANING: Hammermill followed by fanning mill (Wheeler & Hill, 1957; Wheeler, 1950; Hoover et al., 1948; Hoover et al., 1947)

PRETREATMENT

DURATION OF GOOD VIABILITY: 8 years (McWilliams, 1950); >58 months (McAlister, 1943)
STRATIFICATION: Prechill at 5°C for 2 weeks (AOSA, 1978); KNO_3 and prechill for 12 weeks at 2-4°C (Wiesner & Kinch, 1964; Wiesner, 1963); Prechill at 40°F for 21 days (Niffenegger & Schneiter, 1963); Moist sand for 60 days at 2-4°C (Rogler, 1960a); 3 weeks at 4°C (Dawson & Heinrichs, 1952)
SCARIFICATION: Remove lemma and palea (Fendall & Carter, 1965); Remove lemma over the embryo and rupture the pericarp (Grabe, 1963); Immerse seed in 95% H_2SO_4 for 10 minutes (Dawson & Heinrichs, 1952); Mechanical scarification or treatment with acid (Hoover et al., 1948)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 15-30°C at 16-8 hours (AOSA, 1978)
LIGHT: Dark required (AOSA, 1978); Better germination in dark (Niffenegger & Schneiter, 1963)
GERMINATIVE CAPACITY: 25% (Atkins & Smith, 1967); 41% (Niffenegger & Schneiter, 1963); 60% (Cooper et al., 1957); 10-20% for fresh seed, 50-60% for 1 year old seed,

80-90% for new seed moist chilled for 30 days (Wheeler & Hill, 1957); 5-10% for fresh seed, 50-60% after 1 year (Wheeler, 1950; Hoover et al., 1947); 24% (Stefferud, 1948)
COMMENTS: Moisten substratum with 0.2% KNO_3 (AOSA, 1978)

CULTURAL PRACTICES

PLANTING DEPTH: 1" (McWilliams, 1955)
PLANTING TIME: Best results from fall plantings (Kilcher, 1961): Late fall (McWilliams, 1955)
SOIL TEXTURE: Adapted to sandy, loamy (Heady, 1975); Sandy-good, silty-good, clayey-good (Vallentine, 1971); Silt or clay (Atkins & Smith, 1967); Best growth on sandier soils (Donahue et al., 1956); Sandy (Hoover et al., 1948)
SOIL MOISTURE: Medium moisture requirement (Cooper et al., 1957)
COMMENTS: Greenhouse: Most seedlings produced when seeds are planted the third year after harvest (Robocker et al., 1953)

STIPA WILLIAMSII Scribn.
Williams Needlegrass

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)

TRICHACHNE CALIFORNICA (Benth.) Chase
Arizona Cottontop

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

SEEDS/UNIT WT: 718,000/lb (Stefferud, 1948)
METHOD OF COLLECTION: Forage harvester can be used (Harmond et al., 1961); Suction equipment or bug catchers (Andersen et al., 1953)
METHOD OF CLEANING: Process with a hammermill (Flory & Marshall, 1942)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)
GERMINATIVE CAPACITY: 44% (Stefferud, 1948)

CULTURAL PRACTICES

SOIL TEXTURE: Clay to sandy loam (Andersen et al., 1953)

TRIDENS ALBESCENS (Vasey) Woot. & Standl.
White Tridens

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

TRIDENS ELONGATUS (Buckl.) Nash
Rough Tridens

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryposis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

TRIDENS MUTICUS (Torr.) Nash
Slim Tridens

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

LABORATORY GERMINATION

TEMPERATURE: Fluctuating: 20-30°C at 16-8 hours (Haferkamp & McSwain, 1951)
LIGHT: Light required (Haferkamp & McSwain, 1951)

TRISETUM SPICATUM (L.) Richt.
Spike Trisetum

FAMILY: Gramineae
LIFE FORM: Perennial native grass
FRUIT: Caryopsis (Harrington, 1964)

PROCUREMENT

METHOD OF COLLECTION: Hand harvest (Sayers, 1963a)

BEST DOCUMENT AVAILABLE

METHOD OF CLEANING: Hand rubbing, sifting over 3 series of graduated screens and a flowing air blast separator (Sayers, 1963a)

PRETREATMENT

STRATIFICATION: Stratification not necessary (Pelton, 1956)
SCARIFICATION: Scarification not necessary (Pelton, 1956)

LABORATORY GERMINATION

TEMPERATURE: Constant: 25°C (Sayers & Ward, 1966); Fluctuating: 29-25°C at 15-9 hours (Sayers & Ward, 1966); 15-20°C, 20-25°C at 15-9 hours (Sayers, 1963a, 1963b)
LIGHT: Germination in high latitude populations stimulated by light; germination in low latitude populations stimulated by dark (Clebsch & Billings, 1976); Inhibited by light (Amen, 1966); Better germination in dark (Sayers & Ward, 1966; Bonde, 1965; Bliss, 1958)
GERMINATIVE ENERGY: 50% in 14 days (Sayers & Ward, 1966)
GERMINATIVE CAPACITY: 90% in 28 days (Sayers & Ward, 1966); 77.1% (Bliss, 1958)

CULTURAL PRACTICES

EXPOSURE: Withstands shade (Sampson et al., 1951)
SOIL MOISTURE: Moist preferred but withstands dry soils (Sampson et al., 1951)
DRAINAGE: Well drained (Sampson, 1917)

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GLOSSARY OF TERMS

Comments: Any information related to seed germination not covered in the other categories.

Comments: Field: Suggestions for growing the plant in a natural setting.

Comments: Greenhouse: Suggestions for growing the plant in a greenhouse.

Common Name: Common names used in this publication are those most commonly encountered in the literature.

Cultural Practices: Information related to how, where, and when to plant the seeds.

Drainage: The overall soil aeration regime to which the plant is adapted.

Duration of Good Viability: The length of time seeds can be stored before original germination is reduced by one-half.

Exposure: Usually refers to whether the plant is shade tolerant or requires full sunlight for vigorous growth.

Family: Three plant families are included in this publication--the grass family (Gramineae or Poaceae), the sedge family (Cyperaceae), and the rush family (Juncaceae).

Fruit: The dry, indehiscent, one-seeded fruit of the Gramineae is termed a caryopsis. In most grasses the pericarp and seed coat are fused; however, in certain genera such as *Sporobolus* and *Eleusine* the seed coat remains separate from the pericarp. Some authors have referred to this type of fruit as an achene or utricle (Gould, 1968). The small, dry, hard, indehiscent, one locular, one-seeded fruit of the Cyperaceae is an achene (Gould, 1968; Harrington, 1964). The dry, more or less dehiscent fruit of the Juncaceae which is composed of more than one carpel is termed a capsule (Gould, 1968; Harrington, 1964).

Germinative Capacity: The germination percentage after complete germination is obtained under a given set of conditions.

Germinative Energy: This is only an approximate figure and represents the peak of germination activity. It is the time interval in which the largest percentage of seeds germinate.

Introduced: A plant species that is not part of the original flora of a given area (Range Term Glossary Committee, 1974).

Laboratory Germination: Results of experimental germination of seeds under standard conditions specified for seed testing.

Life Form: Life form descriptions followed the characteristics listed for each species in the National List of Scientific Plant Names (USDA, 1971).

Light: An indication of whether germination was promoted or inhibited by the presence or absence of light.

Method of Cleaning: Commonly used methods to break loose inflorescences and remove trashy material.

Method of Collection: Commonly used techniques for collecting cultivated and/or wild seed.

Method of Storage: Techniques used to prolong the viability of seeds until they are needed for planting.

Moisture: Although not specifically mentioned in much of the literature, it is assumed that the seeds are kept constantly moist unless otherwise stated.

Native: A plant species that is part of the original flora of a given area (Range Term Glossary Committee, 1974).

Naturalized: A plant species that is not part of the original flora of a given area but is an important, self propagating component of the plant community.

Organic Matter: Whether or not the plant requires high levels of organic materials in the soil. This is usually an indication of sensitive moisture requirements.

Planting Depth: Recommended depths to which the seeds should be planted in soil.

Planting Time: Recommended season or time of year of planting for best germination and establishment. This can be expected to vary considerably with geographic location.

Precipitation: The overall climatic precipitation zone to which the plant is adapted.

Pretreatment: Techniques used to prolong viability, overcome seed dormancy, and enhance rapid and complete germination.

Procurement: Terms relating to the collection or purchase of seed.

Salinity: A measure of salt content of soil. A saline soil has an electrical conductivity of 4 or more millimhos per centimeter.

Scarification: Refers to any treatment used to overcome seed dormancy in which the seed coat or outer covering (such as, the lemma and palea) is fractured, disrupted, or dissolved.

Scientific Name: Generic and specific names used in this publication are those most commonly encountered in the literature. Several have been revised; for example, *Andropogon barbinodis* Lag. and *A. saccharoides* Swartz were revised to *Bothriochloa barbinodis* (Lag.) Herter and *B. saccharoides* (Swartz) Rydb., respectively. Information in this publication is presented in general fashion; therefore, mention of specific varieties or selection is usually avoided.

Seed Maturity: The time of year when seed is usually ready for collection.

Seeds/Unit Wt: The number of seeds per ounce, gram, kilogram or pound. If no units are given, it is number of seeds per pound.

Sodic Soil: A soil that contains sufficient sodium to interfere with the growth of most plants, and in which the exchangeable sodium percantage is 15 or more.

Soil Depth: The vertical extent of soil material in which the plant grows best. Deep means greater than 60 inches; moderately deep means 40 to 60 inches; moderate means 20 to 40 inches; moderately shallow means 10 to 20 inches; shallow means less than 10 inches to parent material.

Soil Moisture: The overall moisture regime to which the plant is adapted. Wet means the plant grows in soil saturated in water; moist means the soil normally contains sufficient moisture for plant growth; dry means the soil is characterized by extended periods of drought.

Soil pH: The overall level of acidity or alkalinity in which the plant will grow.

Soil Texture: The overall textural preference of the mature plant.

Stratification: Refers to any treatment used to overcome seed dormancy in which the seeds are exposed to low temperature under moist conditions.

Temperature: Usually the optimum temperature for germination suggested by the research results.

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APPENDIX A. Colorado Grasses and Grasslike Plants Which Have Been Evaluated by USDA Soil Conservation Service Plant Materials Centers.

Species	State[1]									
	AR	CA	CO	ID	KA	MT	NM	OR	TX	WA
Agropyron albicans						x				
A. *caninum*			x		x	x				
A. *cristatum*		x	x		x	x				
A. *dasystachyum*		x	x	x	x	x	x			x
A. *desertorum*		x	x		x	x				
A. *elongatum*	x	x	x		x	x	x	x		
A. *inerme*			x	x	x	x	x			x
A. *intermedium*		x	x		x	x	x	x		x
A. *pseudorepens*						x				
A. *repens*			x			x				
A. *riparium*	x	x	x		x	x	x	x		
A. *smithii*	x	x	x	x	x	x	x		x	
A. *spicatum*			x			x	x			x
A. *subsecundum*			x	x		x				
A. *trachycaulum*		x	x	x	x	x				
A. *trichophorum*		x	x		x	x	x	x		
Agrostis alba		x								
A. *scabra*						x				
Alopecurus aequalis						x				
A. *pratensis*						x				
Andropogon barbinodes	x								x	
A. *gerardii*	x				x	x	x		x	
A. *hallii*	x				x	x	x		x	
A. *saccharoides*	x									
A. *scoparius*	x		x		x	x	x		x	
Aristida fendleriana			x							
A. *longiseta*	x					x				
Arrhenatherum elatius						x				
Avena fatua	x									
Beckmannia syzigachne						x				
Bouteloua curtipendula	x		x		x	x	x		x	
B. *eriopoda*	x						x			
B. *gracilis*	x		x		x	x	x		x	
B. *hirsuta*	x									
Bromus anomalus			x			x				
B. *carinatus*	x	x	x							
B. *catharticus*	x						x			
B. *ciliatus*			x							
B. *inermis*		x	x		x	x	x			
B. *japonicus*						x				
B. *marginatus*			x			x				x
B. *mollis*		x								
B. *polyanthus*			x							
B. *pumpellianus*			x			x				
B. *tectorum*		x								

APPENDIX A.--Continued

Species	State[1]									
	AR	CA	CO	ID	KA	MT	NM	OR	TX	WA
Buchloe dactyloides					x	x	x		x	
Calamagrostis canadensis			x			x				
C. inexpansa						x				
C. montanensis						x				
Calamovilfa longifolia			x		x	x	x		x	
Carex eleocharis						x				
C. nebraskensis						x				
Chloris virgata	x						x			
Cynodon dactylon	x	x							x	
Dactylis glomerata		x	x		x	x	x	x		x
Danthonia californica			x							
D. intermedia			x							
D. parryi			x				x			
Deschampsia caespitosa			x			x				
Distichlis stricta	x		x			x				
Echinochloa crusgalli						x				
Elymus canadensis			x			x	x		x	
E. cinereus			x	x		x	x			
E. glaucus			x			x				
E. junceus			x		x	x	x			
E. salinus			x			x				
E. triticoides		x	x	x		x	x			
E. virginicus			x						x	
Eragrostis trichodes	x				x				x	
Eriophorum scheuchzeri						x				
Festuca arizonica			x			x	x			
F. arundinaceaa	x	x	x				x	x		
F. idahoensis			x			x				
F. ovina			x			x		x		x
F. rubra						x				
F. scabrella						x				
F. thurberi			x							
Helictotrichon hookeri						x				
Hesperochloa kingii			x			x				
Hierochloe odorata			x						x	
Hilaria jamesii	x		x				x			
Hordeum brachyantherum						x				
H. jubatum						x				
Koelaria cristata			x							
Lolium multiflorum		x								
L. perenne	x	x			x	x	x			
Melica bulbosa			x							
M. spectabilis			x			x				
Muhlenbergia cuspidata						x				
M. montana			x				x			
M. porteri	x									

APPENDIX A.--Continued

	State[1]									
Species	AR	CA	CO	ID	KA	MT	NM	OR	TX	WA
M. racemosa						x				
M. schreberi									x	
M. wrightii			x			x	x			
Oryzopsis hymenoides	x	x	x	x		x	x			
Panicum obtusum	x						x		x	
P. virgatum					x	x	x		x	
Paspalum dilatatum		x								
Phalaris arundinacea		x	x		x	x	x	x		
Phleum alpinum			x							
P. pratense							x			
Poa alpina						x				
P. ampla		x	x			x	x			
P. annua		x								
P. arida						x	x			
P. canbyi										x
P. compressa						x				
P. glaucifolia						x				
P. juncifolia						x				
P. nevadensis						x				
P. pratensis		x				x				
P. rupicola						x				
Puccinellia airoides						x				
P. distans						x	x			
Redfieldia flexuosa			x						x	
Setaria glauca						x				
S. lutescens						x				
S. macrostachya	x								x	
S. viridis						x				
Sitanion hystrix		x	x	x						
Sorghastrum nutans					x	x	x		x	
Sorghum halepense			x							
Spartina pectinata					x	x	x		x	
Sporobolus airoides	x		x	x	x	x	x		x	
S. asper					x	x			x	
S. contractus	x		x			x	x			
S. cryptandrus	x		x	x		x	x			
S. giganteus	x		x							
S. texanus					x				x	
Stipa columbiana			x			x				
S. comata			x			x	x			
S. lettermani			x				x			
S. neomexicana			x							
S. occidentalis			x							
S. richardsonii			x							
S. robusta			x							
S. scribneri			x			x				

APPENDIX A.--Continued

Species	State[1]									
	AR	CA	CO	ID	KA	MT	NM	OR	TX	WA
S. speciosa			x							
S. viridula	x		x		x	x				
Trichachne californica	x						x			
Trisetum spicatum			x			x				

[1] STATE: AR = Arizona; CA = California; CO = Colorado; ID = Idaho; MT = Montana; NM = New Mexico; OR = Oregon; TX = Texas; WA = Washington.

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APPENDIX B. Colorado Grass Varieties and Cultivars Which Have Been Released by the USDA Soil Conservation Service Plant Materials Centers.

Scientific Name	Cultivar	Common Name	Source	Date Released	SCS PMC†
Agropyron dasystachyum	Critana	Thickspike wheatgrass	Montana	1971	Bridger
Agropyron desertorum	Nordan	Crested wheatgrass	Dickinson, ND	1953	Bismarck
Agropyron elongatum	Alkar	Tall wheatgrass	U.S.S.R.	1951	Pullman & Aberdeen
Agropyron elongatum	Jose	Tall wheatgrass	Australia	1965	Los Lunas
Agropyron elongatum	Largo	Tall wheatgrass	Turkey	1961	Los Lunas
Agropyron inerme	Whitmar	Bearless bluebunch wheatgrass	Whitman County, WA	1946	Pullman & Aberdeen
Agropyron intermedium	Amur	Intermediate wheatgrass	China	1952	Los Lunas
Agropyron intermedium	Greenar	Intermediate wheatgrass	U.S.S.R.	1945	Pullman & Aberdeen
Agropyron intermedium	Tegmar	Dwarf intermediate wheatgrass	Turkey	1968	Aberdeen & Pullman
Agropyron riparium	Sodar	Streambank wheatgrass	Grant County, OR	1954	Aberdeen & Pullman
Agropyron smithii	Arriba	Western wheatgrass	Flagler, CO	1973	Los Lunas
Agropyron smithii	Barton	Western wheatgrass	Barton County, KS	1970	Manhattan
Agropyron smithii	Rosana	Western wheatgrass	Forsyth, MT	1972	Bridger
Agropyron trachycaulum	Primar	Slender wheatgrass	Beebe, MT	1946	Pullman
Agropyron trichophorum	Lunar	Pubescent wheatgrass	U.S.S.R.	1963	Los Lunas
Agropyron trichophorum	Topar	Pubescent wheatgrass	U.S.S.R.	1953	Pullman & Aberdeen

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APPENDIX B.--Continued

Scientific Name	Cultivar	Common Name	Source	Date Released	SCS PMC[†]
Andropogon gerardi	Kaw	Big bluestem	Flinthills, KS	1950	Manhattan
Andropogon hallii	Elida	Sand bluestem	Elida, NM	1963	Los Lunas
Bouteloua curtipendula	Butte	Sideoats grama	Holt & Platte Counties, NB	1958	---
Bouteloua curtipendula	El Reno	Sideoats grama	El Reno, OK	1944	Manhattan
Bouteloua curtipendula	Premier	Sideoats grama	Mexico	1960	---
Bouteloua curtipendula	Trailway	Sideoats grama	Holt County, NB	1958	---
Bouteloua curtipendula	Uvalde	Sideoats grama	Knippa, TX	1950	Tucson
Bouteloua curtipendula	Vaughn	Sideoats grama	Vaughn, NM	1940	Los Lunas
Bouteloua eriopoda	Nogal	Black grama	Socorro, NM	1971	Los Lunas
Bouteloua eriopoda	Sonora	Black grama	Arizona & New Mexico	1965	Tucson
Bouteloua gracilis	Lovington	Blue grama	Lovington, NM	1963	Los Lunas
Bromus carinatus	Cucamonga	Mountain brome	Cucamonga, CA	1949	Pleasanton[‡]
Bromus catharticus	Prairie	Rescuegrass	New Zealand	1946	Pleasanton[‡]
Bromus inermis	Elsberry	Smooth brome	Missouri & Iowa	1954	Elsberry
Bromus inermis	Fischer	Smooth brome	Shenandoah, IA	1943	---

APPENDIX B.--Continued

Scientific Name	Cultivar	Common Name	Source	Date Released	SCS PMC†
Bromus inermis	Manchar	Smooth brome	China	1943	Pullman & Aberdeen
Bromus marginatus	Bromar	Mountain Brome	Pullman, WA	1946	Pullman
Bromus mollis	Blando	Soft chess	San Ramon, CA	1954	Pleasanton†
Buchloe dactyloides	Texoka	Buffalograss	Kansas, Oklahoma, & Texas	1974	Manhattan & Knox City
Calamovilfa longifolia	Goshen	Prairie sandreed	Goshen County, WY	1976	Bridger
Cynodon dactylon	Tufcote	Bermudagrass	South Africa	1967	National
Dactylis glomerata	Akaroa	Orchardgrass	New Zealand	1953	Pleasanton†
Dactylis glomerata	Latar	Orchardgrass	U.S.S.R.	1957	Pullman & Aberdeen
Dactylis glomerata	Pomar	Orchardgrass	U.S.S.R.	1966	Aberdeen
Dactylis glomerata	Sandia	Orchardgrass	Germany	1953	Los Lunas
Eragrostis trichodes	Bend	Sand lovegrass	Kansas & Oklahoma	1971	Manhattan
Eragrostis trichodes	Nebraska-27	Sand lovegrass	Holt County, NB	1949	---
Eragrostis trichodes var. *pilifera*	Mason	Sandhill lovegrass	Mason, TX	1971	Knox City
Festuca arizonica	Redondo	Arizona fescue	Los Alamos, NM	1973	Los Lunas
Festuca megalura	Zorro	Annual fescue	Lockeford, CA	1977	Lockeford
Festuca ovina	Covar	Hard fescue	Turkey	1977	Pullman
Muhlenbergia wrightii	El Vado	Spike muhly	Park View, NM	1973	Los Lunas

APPENDIX B.--Continued

Scientific Name	Cultivar	Common Name	Source	Date Released	SCS PMC†
Oryzopsis hymenoides	Nezpar	Indian ricegrass	Whitebird, ID	1978	Aberdeen
Oryzopsis hymenoides	Paloma	Indian ricegrass	Pueblo, CO	1974	Los Lunas
Panicum virgatum	Alamo	Switchgrass	Texas	1978	Knox City
Panicum virgatum	Blackwell	Switchgrass	Blackwell, OK	1944	Manhattan
Panicum virgatum	Cave-in-Rock	Switchgrass	Southern Illinois	1974	Elsberry
Panicum virgatum	Kanlow	Switchgrass	Wetumka, OK	1963	Manhattan
Panicum virgatum	Nebraska 28	Switchgrass	Holt County, NB	1949	---
Paspalum notatum	Pensacola	Bahiagrass	Pensacola, FL	1944	Americus
Paspalum notatum	Wilmington	Bahiagrass	Wilmington, NC	1971	Americus & Coffeeville
Phalaris arundinacea	Ioreed	Reed canarygrass	Composite	1946	---
Poa ampla	Sherman	Big bluegrass	Sherman County, OR	1945	Pullman
Poa bulbosa	P-4874	Bulbous bluegrass	Pullman, WA	1956	Pullman
Poa pratensis	Cougar	Kentucky bluegrass	Denmark	1965	Pullman
Poa pratensis	Newport	Kentucky bluegrass	Lincoln County, OR	1958	Pullman
Schizachyrium scoparium	Aldous	Little bluestem	Flinthills, KS	1966	Manhattan
Schizachyrium scoparium	Cimarron	Little bluestem	Western Kansas & Oklahoma	1979	Manhattan

APPENDIX B.--Continued

Scientific Name	Cultivar	Common Name	Source	Date Released	SCS PMC[†]
Schizachyrium scoparium	Pastura	Little bluestem	Pecos, NM	1963	Los Lunas
Sorghastrum nutans	Llano	Yellow Indiangrass	Elida, NM	1963	Los Lunas
Sorghastrum nutans	Osage	Indiangrass	Kansas & Oklahoma	1966	Manhattan
Stipa viridula	Green Stipa	Green needlegrass	Mandan, ND	1946	---

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[†] Soil Conservation Service Plant Materials Center that released and evaluated cultivar.

[‡] Operations transferred to Lakeford, California.

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APPENDIX C. Addresses of western United States Plant Materials Centers.

USDA Soil Conservation Service
Plant Materials Centers

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1. 3241 Romero Road
   Tucson, Arizona 85705

2. P.O. Box 68
   Lockeford, California 95236

3. P.O. Box 448
   Meeker, Colorado 81641

4. Box AA
   Aberdeen, Idaho 83210

5. Route 2, Box 314
   Manhattan, Kansas 66509

6. Route 1, Box 119
   Bridger, Montana 59014

7. 1036 Miller Street, S.W.
   Los Lunas, New Mexico 87031

8. 3420 N.E. Granger Avenue
   Corvallis, Oregon 97330

9. Route 1, Box 155
   Knox City, Texas 79529

10. 257 Johnson Hall
    Washington State University
    Pullman, Washington 99163

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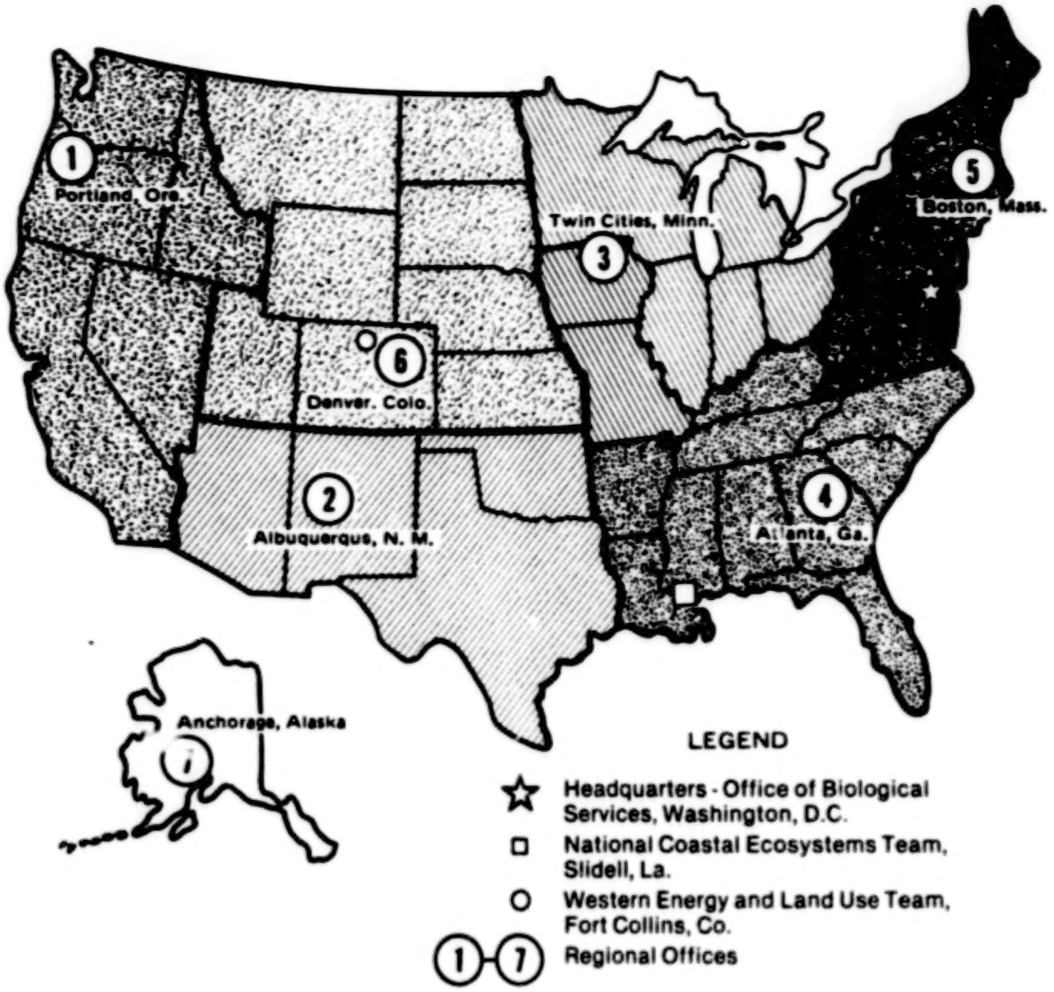
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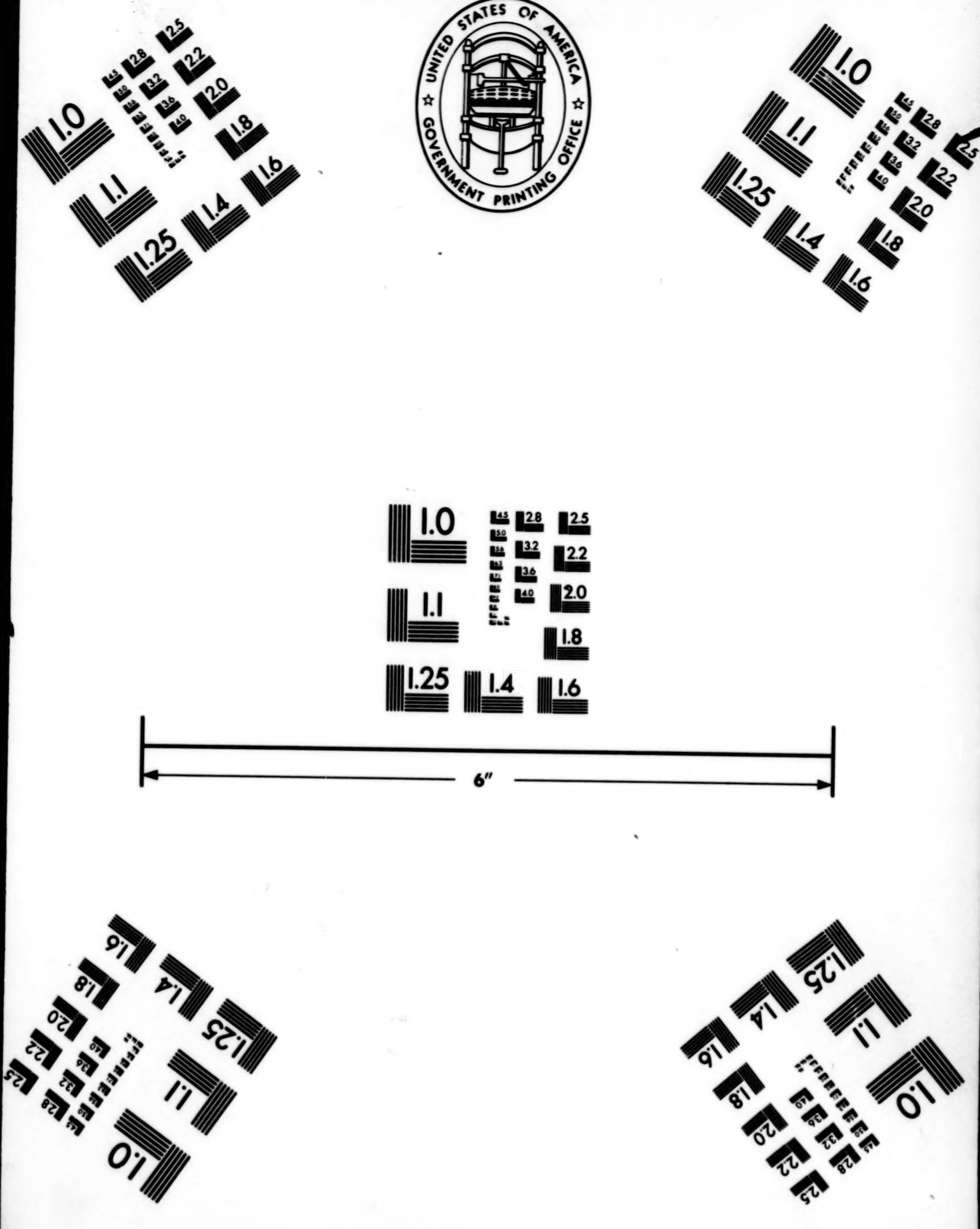
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